Workshop Manual

Octavia II 2004 ➤
Octavia II 2010 ➤

1.6/85 kW FSI engine									
Engine ID	BLF								

Edition 05.2016

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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00 – Technical data

1 Technical data

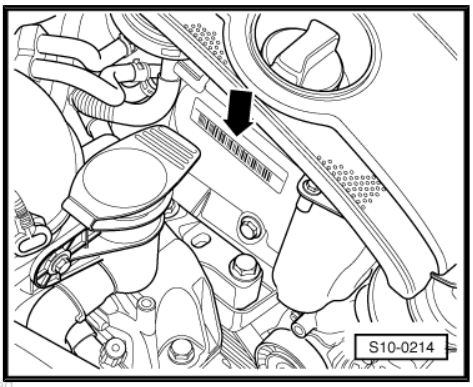
(SRL000956; Edition 05.2016)

1.1 Engine number

The engine identification character and the engine number can be found on the sticker -arrow- at the timing case.

The engine identification character also appears on the vehicle data sticker and on the cylinder block above the transmission.

The engine number consists of up to nine digits (alphanumeric). The first part represents the “engine code” (a maximum of 3 identification letters), the second part the “serial number”. If more than 999.999 engines with the same engine code were produced then the first digit of the six part section will be replaced by a letter.



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1.2 Engine characteristics

Edition 05.2013, version 2.0

Engine identification characters		BLF
Manufactured		05.04 ► 11.08
Exhaust limit values conforming to		EU-4
Displacement	cm^3	1598
Power output	kW at rpm	85/6000
Torque	Nm at rpm	155/4000
Bore	∅ mm	76,5
Stroke	mm	86,9
Compression ratio		12,0:1
Cylinder / valves per cylinder		4/4
RON		unleaded 98 [1)]
Ignition system/fuel injection		Motronic MED 09/05/2010
Type of fuel preparation		homogeneous
Camshaft adjustment		yes
Knock control		1 sensor
Lambda control		2 probes
Catalytic converter		yes
Exhaust gas recirculation		yes
Secondary air system		no

[1)] At least 95 RON in exceptional cases, although engine output is reduced

01 – Self-diagnosis

1 Self diagnosis, safety measures, cleanliness regulations, directions

1.1 Self-diagnosis

This Rep.-Gr. is deleted.

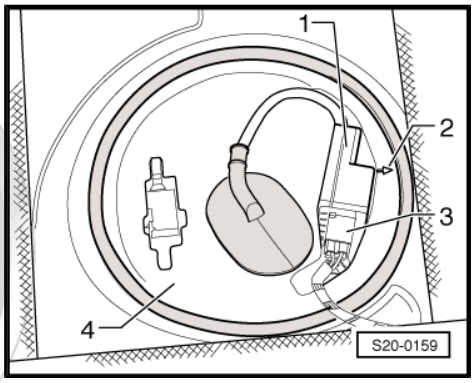
For this use the “Vehicle self-diagnosis”, “Measuring method” and “Fault finding” ⇒ Vehicle diagnostic tester.

1.2 Safety precautions when working on the fuel supply system

WARNING

- *The safety measures for the pressure reduction in the high pressure system must be observed ⇒ page 3 .*
- *The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.*

- Fuel pump is activated by switching on ignition and via driver door contact switch. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit - J538- .



Caution

When undertaking all installation work, particularly in the engine compartment because of its cramped construction, please observe the following:

- *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*

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When removing and installing the fuel gauge sender or the fuel delivery unit from a full or partly filled fuel tank, pay attention to the following points:

- The extraction hose of an exhaust extraction system which is switched on, must be positioned close to the assembly opening of the fuel tank in order to extract the released fuel vapours, even before the work is commenced. If no exhaust extraction system is available, a radial fan (motor not in air flow of fan) with a delivery volume of more than 15 m^3/h must be used.
- Avoid skin contact with fuel!
- Wear fuel-resistant gloves!

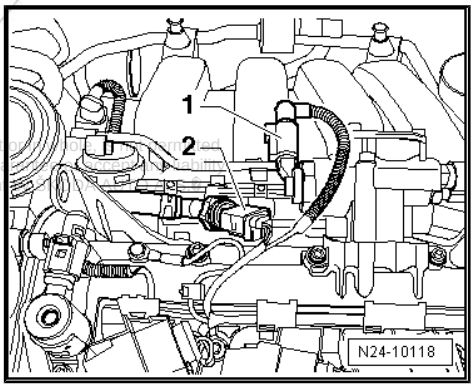
1.3 Reduce pressure in the high-pressure system

WARNING

- *The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).*
- *Before opening the high pressure system, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender - G247- , the fuel pressure in the high pressure system with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described below.*

– Remove engine trim panel with air filter ⇒ page 145 .

– Remove plug -1- from the fuel pressure regulating valve - N276- at the high pressure pump.



– Allow the engine to run for approx. 10 seconds at idling speed.

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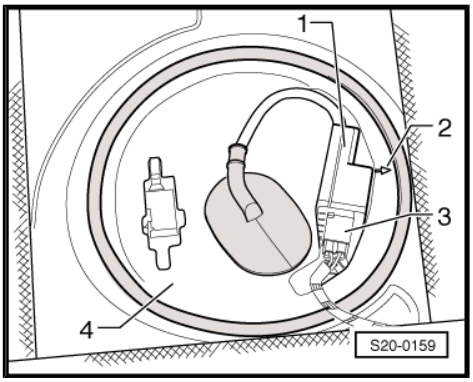
Note

- *When the connector is removed from the fuel pressure regulating valve - N276- at idling speed, the pressure in the high pressure system drops to approx. 0.6 MPa (6 bar).*
- *After high pressure depressurisation, the high-pressure system must be opened as the fuel pressure increases again due to heating.*

– Switch off ignition.

– For safety reasons before opening the fuel system disconnect the plug from the fuel pump control unit - J538- -3-.



WARNING

The fuel lines are pressurized! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Before opening the high pressure system, lay cleaning cloths around the connection point.

– Now lay a clean cleaning cloth around the connection point and carefully open it up, in order to reduce the remaining pressure of approx 0.6 MPa (6 bar). Collect the fuel which flows out.

Note

- *Interrogate the event memory of the engine control unit at the end of the following work and delete all the event memory entries.*
- *The readiness code must be generated if the event memory has been cleared ⇒ Vehicle diagnostic tester.*

1.4 Rules for cleanliness when working on the fuel system

Carefully observe the following five rules for cleanliness when working on the fuel system:

- Thoroughly clean the connection points and their surroundings before releasing.
- Place removed parts on a clean surface and cover. Use lint-free cloths!
- Carefully cover or close opened components if the repair is not completed immediately.
- Only install clean parts: Remove spare parts from their wrapping immediately before fitting. Do not use any parts which have been stored unwrapped (e.g. in tool boxes).
- When the system is open: Avoid using compressed air whenever possible. Avoid moving the vehicle.

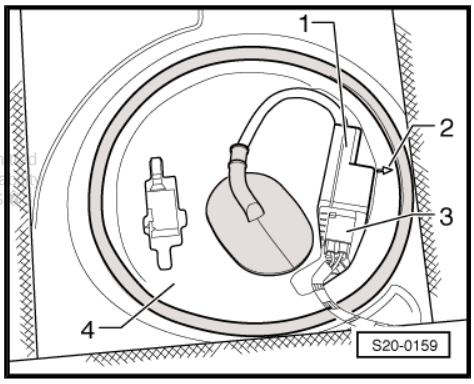
1.5 Safety measures to apply when working on the fuel injection and ignition system

WARNING

- *The safety measures for the pressure reduction in the high pressure system must be observed ⇒ page 3 .*
- *The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.*

Observe the following points to prevent injury to persons and/or damage to the injection and ignition system:

- Do not touch or remove ignition leads and ignition coils with power output stages with the engine running or at start speed.
- Ignition must be switched off before disconnecting and reconnecting the cables of the fuel injection and the ignition system as well as of the test equipment.
- If the engine must be operated at start speed without it starting, as for example, when checking the compression pressure, open lid of fuse carrier in the engine compartment and unplug fuse for Motronic current supply relay - J271- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Fuse assignment varies and depends on the model year.
- Fuel pump is activated by switching on ignition and via driver door contact switch. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit - J538- .



If test and measuring devices are required during test drives observe the following:

- Always secure the test and measuring devices on the rear seat and have a second person operate them there.
- If the test and measuring devices are operated from the passenger seat, the passenger could be injured by the release of the passenger airbag in the event of an accident.

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1.6 General notes on the injection system

Repairing ignition ⇒ page 167

- The engine control unit is equipped with a self-diagnosis system. Before repairs and also for fault finding, first of all interrogate the event memory. Also check the vacuum hoses and connections (unmetered air).
- Fuel hoses in the engine compartment must only be secured with spring-type clips ⇒ ETKA - Electronic catalogue of original parts . The use of clamp-type or screw-type clips is not allowed.
- A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- Do not use sealants containing silicone. Traces of silicone elements drawn in by the engine are not burnt in the engine and damage the lambda probe.
- If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted ⇒ Vehicle diagnostic tester.
- When opening the driver door the fuel pump is activated for 2 seconds in order to build up the pressure in the fuel system.
- Certain inspections may cause the engine control unit to detect and store a fault. It is therefore necessary to interrogate the event memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnostic tester.

Safety measures ⇒ page 4

1.7 General notes on the ignition system

- Switch off the ignition before disconnecting and connecting the battery, as this may damage the engine control unit.
- The engine control unit and further components are equipped with self-diagnosis; inspect ⇒ Vehicle diagnostic tester.
- A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- Certain inspections may cause the engine control unit to detect and store a fault. It is therefore necessary to interrogate the event memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnostic tester.
- If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted ⇒ Vehicle diagnostic tester.

Safety measures ⇒ page 4

Setting data, spark plugs ⇒ Maintenance ; Booklet Octavia II

1.8 Additional instructions when undertaking assembly work on the air-conditioning system

WARNING

Do not open the refrigerant circuit of the air conditioning system.

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Note

In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

Steps which should be taken in order to remove and install the engine without opening the refrigerant circuit:

– Remove the holding clamp(s) of the coolant lines.
– Remove AC compressor from the bracket ⇒ page 21 .
– Mount the AC compressor in such a way that the refrigerant lines/hoses are not under tension.

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10 – Removing and installing engine

1 Removing and installing engine

1.1 Removing engine

Special tools and workshop equipment required

- Engine and gearbox jack . e.g. -V.A.G 1383 A -
- Engine bracket - T40075-
- Double ladder , e. g. -VAS 5085-
- Catch pan , e.g. -VAS 6208-
- Pliers for spring strap clamps

– Enquire the event memories of all control units prior to engine removal ⇒ Vehicle diagnostic tester.

Note

- *The engine is removed downwards together with the gearbox.*
- *All cable straps that have been loosened or cut open when the engine was removed must be attached again in the same location when the engine is installed again.*
- *Leave the ignition key in the ignition lock so that the steering lock does not click into place.*

Observe all safety measures and notes for assembly work on the fuel system, on the injection and ignition system as well as rules for cleanliness ⇒ page 2 .

– Before disconnecting the battery, if necessary remove the adapter for the anti-theft wheel bolts from the luggage compartment.

– Remove battery and battery tray ⇒ Rep. gr. 27 ; Electrical System .

– Remove engine trim panel with air filter ⇒ page 145 .

– Remove air guide for preheating for suction system from the lock carrier.

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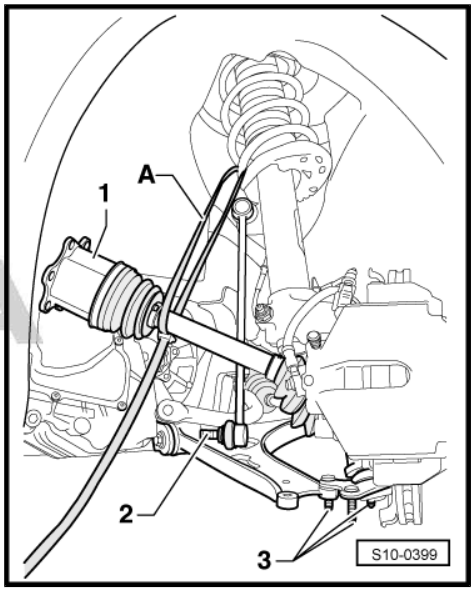
– Remove pre-exhaust pipe with catalytic converter ⇒ page 161 .

– Remove the right and left wheelhouse liner bottom part ⇒ Rep. gr. 66 ; Body Work .

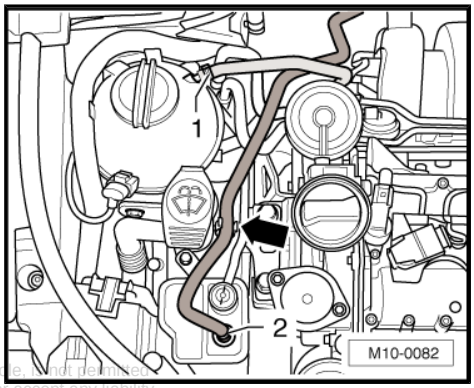
– Remove drive shaft to the right ⇒ Rep. gr. 40 ; Chassis .

– Unscrew the left drive shaft from the flange shaft of the gearbox.

– Unscrew the nut from the left coupling rod -2- and press off the coupling rod from the anti-roll bar.
– Unscrew the nuts from the left steering joint -3- and press the steering joint out of the suspension arm.
– Turn steering to full left lock.
– Swivel the steering joint outwards and secure the drive shaft -1- with a band -A- in the wheelhouse.
– Insert a pin screw in the suspension arm in order to stabilise the steering joint.
– Remove V-ribbed belt ⇒ page 22 .
– Drain coolant ⇒ page 98 .



– Remove coolant hose -1- from the expansion reservoir.
– Disconnect bleeder hose from activated charcoal filter -2- and washer fluid reservoir -arrow- and expose.



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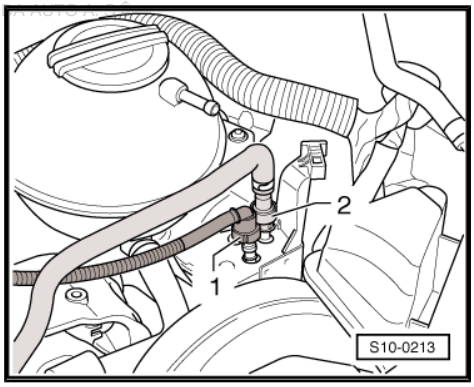
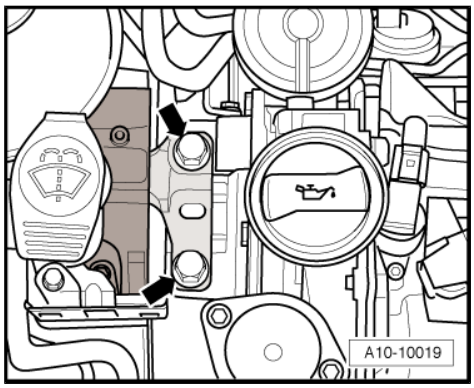
– Disconnect fuel feed line -2- ⇒ page 116 .

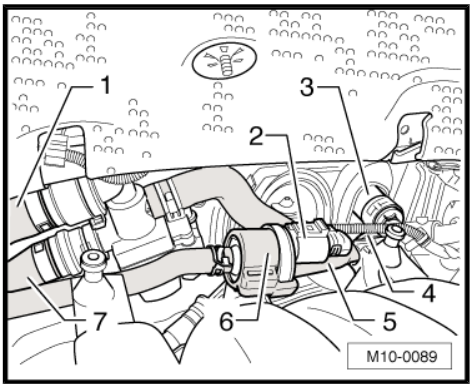


– Slightly loosen the screws -arrows- of the assembly bracket at the engine (less than 1 revolution).
– Remove coolant hose at top of radiator.

Vehicles without auxiliary heating.

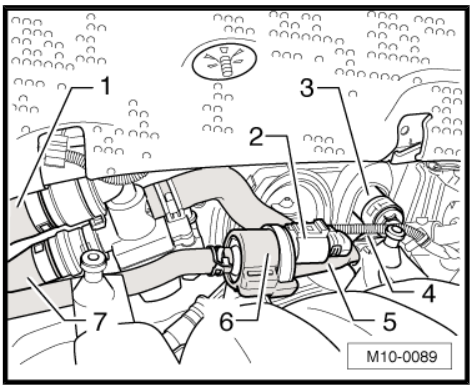


– Remove coolant hoses -3- and -4- from the heat exchanger on the front face.
– Remove connector -2- and hose -5- from the electrical solenoid valve 1 for activated charcoal filter - N80- -6-.
– Remove mounting bracket with the electrical solenoid valve 1 for activated charcoal filter - N80- -6- from the intake manifold.

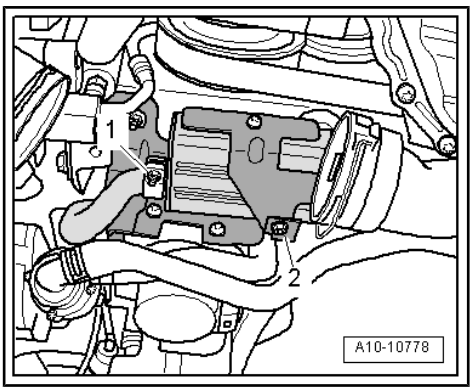


Vehicles with auxiliary heating.

– Remove coolant hose -3- from the heat exchanger on the front face.
– Remove connector -2- and hose -5- from the electrical solenoid valve 1 for activated charcoal filter - N80- -6-.
– Remove mounting bracket with the electrical solenoid valve 1 for activated charcoal filter - N80- -6- from the intake manifold.
– Remove coolant hoses -1- and -7- from the coolant shut-off valve on the heater unit - N279- .

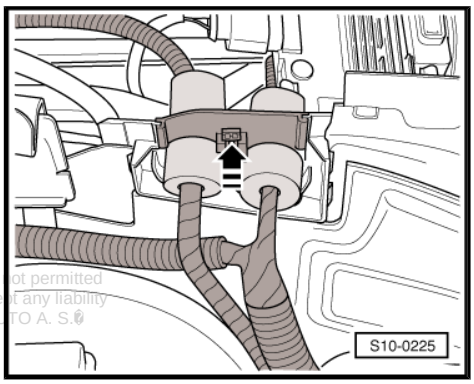


– Unscrew clamp -1- and remove screw -2-.
– Detach the pre-exhaust pipe of the auxiliary heating and additional heating.
– Disconnect the necessary connections from the coolant hoses.



Continued for all vehicles

– Disconnect the plug of the engine wiring harness from the engine control unit (front plug) ⇒ page 154 .
– Release guide for engine wiring harness and pull out upwards -arrow-.



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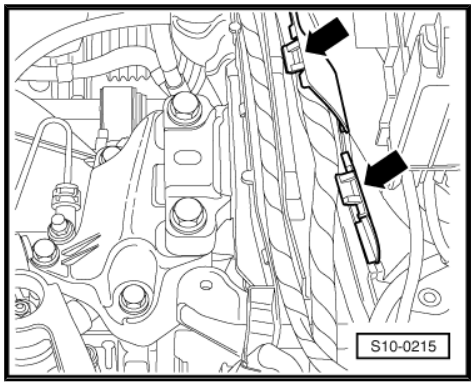
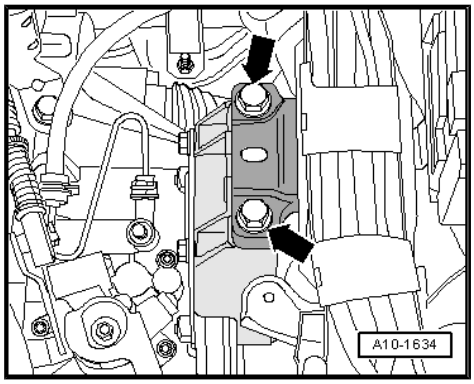
– Open all fuses for the engine wiring harness at frame side rail -arrows-.
– Open other attachments of the engine wiring harness, remove engine wiring harness and attach to engine.
– Remove/unclamp all electrical lines from the gearbox, generator and starter motor and uncover them.



– Slightly loosen the screws -arrows- of the assembly bracket at the gearbox (less than 1 revolution).



Vehicles fitted with a manual gearbox

– Unscrew shift mechanism from gearbox ⇒ Rep. gr. 34 ; Manual gearbox .
– Remove the slave cylinder ⇒ Rep. gr. 30 ; Manual gearbox and tie up to the side. Do not open line system.

Caution

After removing the slave cylinder, do not depress the clutch pedal. Doing so may damage the slave cylinder.

Vehicles with automatic gearbox

– Remove shift mechanism from gearbox ⇒ Rep. gr. 37 ; Automatic Gearbox .

Vehicles with air conditioning

WARNING

Do not open the refrigerant circuit of the air conditioning system.

Caution

In order to avoid damage to the AC compressor as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

– Remove AC compressor from the bracket ⇒ page 21 .

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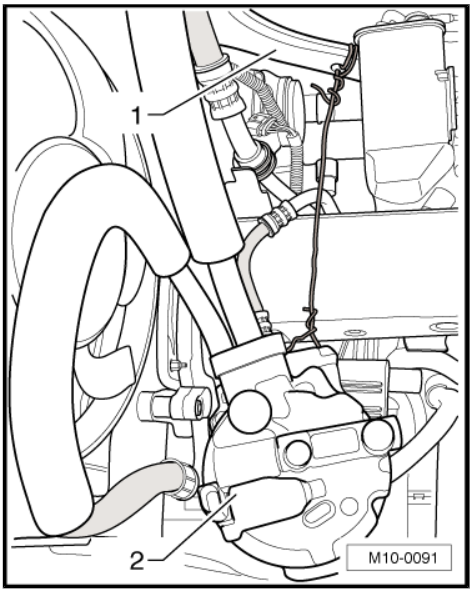
– Secure AC compressor -2- to the lock carrier -1-. To do so, pull a wire through the right suspension of the AC compressor.

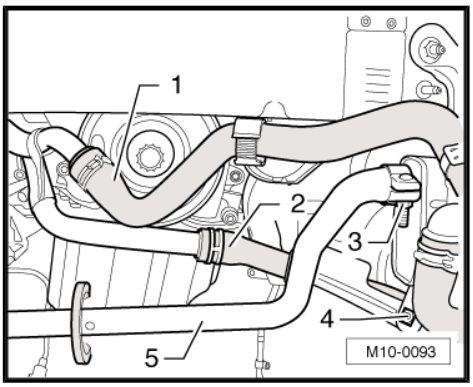


Vehicles with auxiliary heating.

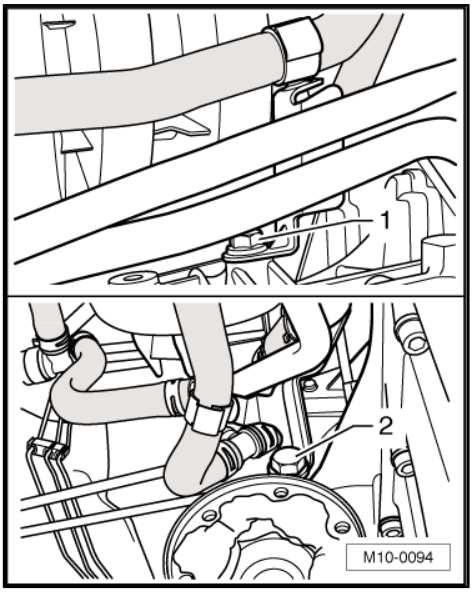
– Undo the nut -3-, unscrew the screw -4- and remove the exhaust pipe -5- of the auxiliary heating.

– Position catch pan underneath.

– Open the spring-type clips on the coolant hoses -1- and -2- and remove the coolant hoses.



– Unscrew screws -1- and -2- and remove the coolant pipes from the coolant hoses. The coolant hoses remain connected.



Continued for all vehicles

– Remove the generator ⇒ Rep. gr. 27 ; Electrical System .

– Remove/unclamp all other necessary electrical cables and hoses from the engine and expose them.

– Fix all electric cables and hoses to the engine.

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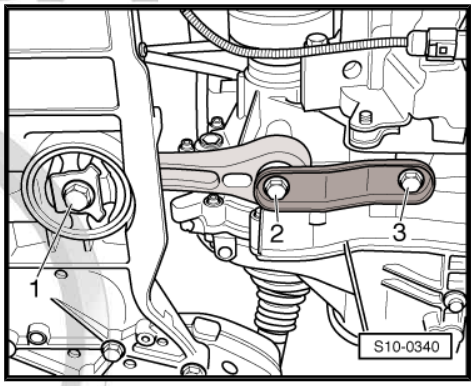
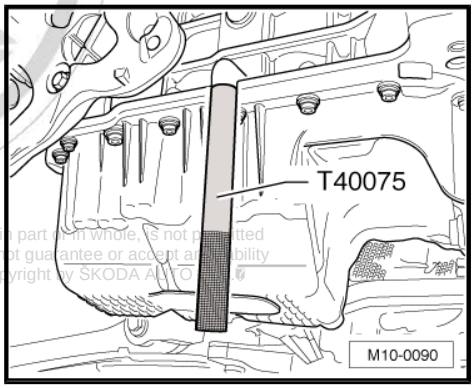
– First, unscrew the screw -1-.
– Then unscrew screws -2- and -3- and remove the pendulum support.



– First of all, secure the pin bolt from the engine mount - T40075- to the engine.



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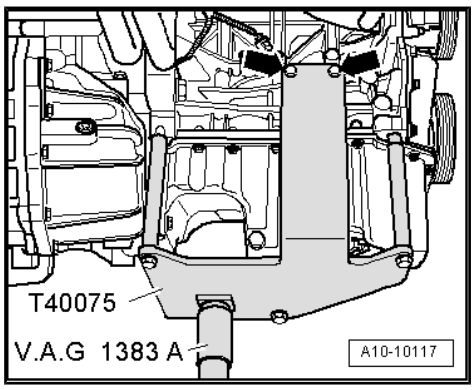
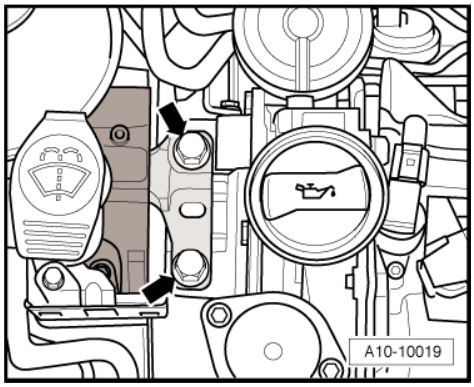
– Position the engine mount - T40075- in the engine/gearbox jack - V.A.G 1383 A- .
– Tighten engine mount - T40075- at the bolt.
– Screw engine mount - T40075- onto cylinder block reverse side to 20 Nm -arrows-.
– Raise the engine/gearbox unit slightly.



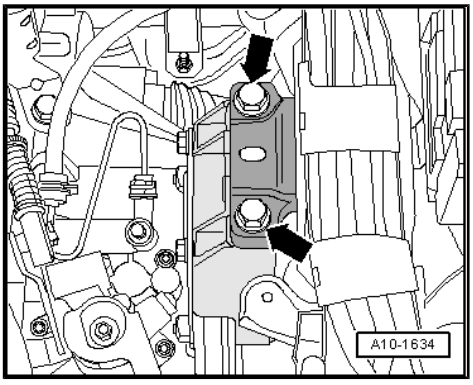
Note

Use double ladder - VAS 5085- to release the screws for the assembly bracket.

– Unscrew screws -arrows- on the assembly bracket from the engine mount.



– Unscrew screws -arrows- on the assembly bracket from the gearbox jack.



Note

- *Check whether all hose and line connections between engine/ gearbox unit and body are released.*
- *When lowering carefully guide the engine/gearbox assembly, in order to avoid damage.*

– Pull engine/gearbox unit as far forward as possible and lower slowly downwards.

1.2 Securing the engine to the assembly stand

Special tools and workshop equipment required

- Lifting device - MP9-201 (2024 A)-
- Engine mount - MP1-202- for assembly stand - MP9-101- , where necessary engine and gearbox jack - VAS 6095-
- Assembly stand - MP9-101-
- Workshop crane , e.g. -V.A.S 6100-

Secure the engine with engine mount - MP 1-202- on the assembly stand - MP 9-101- before performing assembly work.

– Unscrew gearbox from engine:

- ⇒ Gearbox; Rep. gr. 34 .
- ⇒ Automatic gearbox; Rep. gr. 37 .

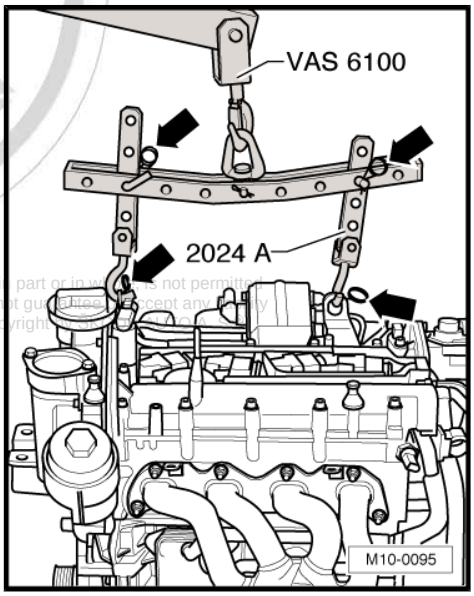
– Insert the lifting device - 2024 A- as follows and use the workshop crane to lift out of the engine and gearbox jack - V.A.G 1383 A- .

On the belt pulley side: 2. Hole of vertical perforated rails in Position 2

Gearbox side: 3. Hole of vertical perforated rails in Position 7

WARNING

Use securing pins on the hooks and rig pins -arrows-, in order to avoid injuries and damages to the engine.



- The securing positions of the handle labelled 1…4 point towards the belt pulley.
- The holes in the perforated rails are counted off from the hook.

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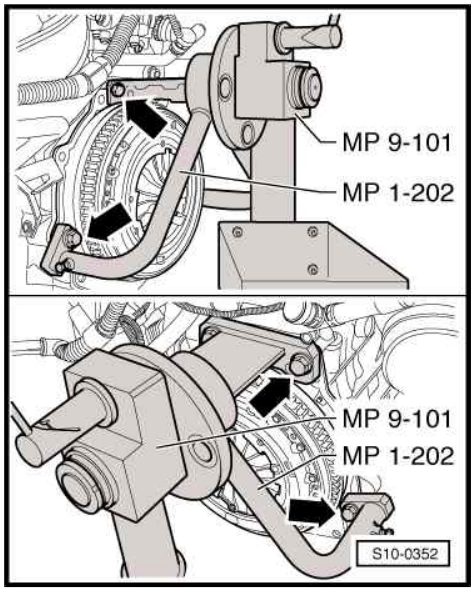
– Screw engine mount - MP 1-202- to engine and secure to the assembly stand - MP 9-101- .



1.3 Installing engine

- Fit engine and gearbox using engine mount to the engine/ gearbox jack .

Work procedure

Installation is carried out in the reverse order. When installing, observe the following:

Note

- *When undertaking assembly replace self-locking nuts and screws which have been tightened to a torquing angle.*
- *Always replace gasket rings and seals.*
- *Fit all cable straps on again in the same place when installing.*
- *Secure all hose connections with corresponding hose clips.*

– Clean the serration of the drive shaft and if the clutch disc has been used clean the hub serration, remove corrosion and only apply a very thin layer of grease - G 000 100- to the serration of the drive shaft. Subsequently move the clutch disc up and down on the drive shaft until the hub fits smoothly on the shaft. Always remove excess grease.

– After installing the coupling, check the centering of the clutch disc ⇒ Rep. gr. 30 ; Gearbox .

– Check the clutch release bearing for wear. Replace release bearing if worn ⇒ Rep. gr. 30 ; Gearbox .

– Check whether the dowel sleeves for centering the engine/ gearbox are present in the cylinder block; insert if necessary.

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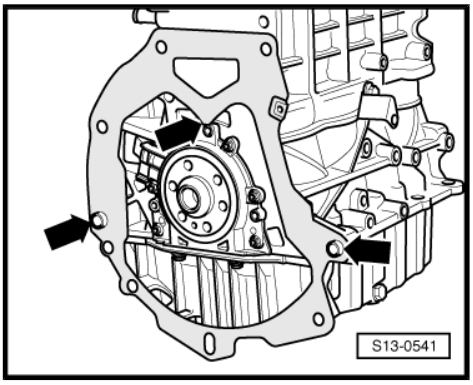
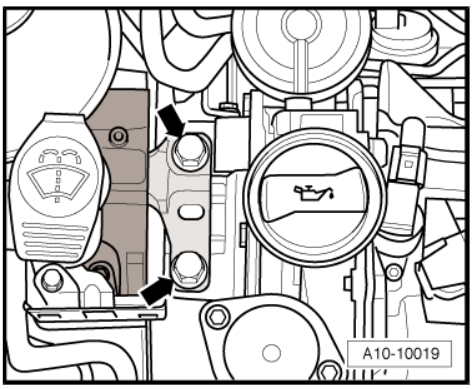
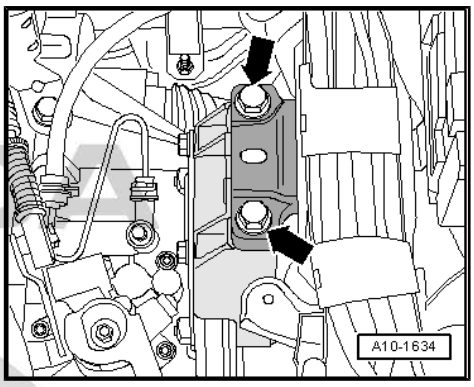
– Ensure that the intermediate plate has been inserted on the sealing flange and is pushed onto the dowel sleeves -arrows-.
– Screw on gearbox to engine ⇒ page 16 .
– Insert engine with gearbox into the body.



– Successively screw in screws for engine mounting -arrows- by hand.



– Successively screw in screws for engine mounting -arrows- by hand.
– Align engine and gearbox mount ⇒ page 17 .
– Remove engine mount - T40075- from engine.



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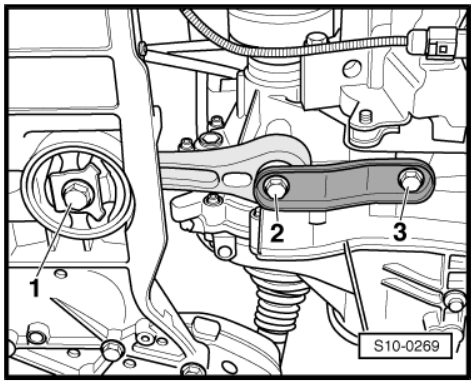
– Screw on pendulum support with new screws -2- and -3- at gearbox and then tighten with new screw -1- at assembly carrier ⇒ page 19 .
– Fit the right drive shaft and screw on the left drive shaft ⇒ Rep. gr. 40 ; Suspension .
– Install generator ⇒ Rep. gr. 27 ; Electrical System .
– Electrical connections and proper routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Vehicles with air conditioning

– Install AC compressor ⇒ page 21 .

Vehicles fitted with a manual gearbox

– Install slave cylinder ⇒ Rep. gr. 30 ; Gearbox .
– Attach shift mechanism and adjust if necessary ⇒ Rep. gr. 34 ; Gearbox .

Vehicles with automatic gearbox

– Install and adjust the selector lever linkage ⇒ Rep. gr. 37 ; Automatic gearbox .

Continued for all vehicles

– Install the V-ribbed belt ⇒ page 22 .
– Checking the oil level ⇒ Maintenance ; Booklet Octavia II .
– Install engine trim panel with air filter ⇒ page 145 .
– Top up coolant ⇒ page 98 .
– Query all fault memories, rectify any faults and delete fault memories ⇒ Vehicle diagnostic tester.

Note

After deleting the event memory of the engine control unit the readiness code must be re-generated.

– Perform a test drive.
– Query all event memories again, rectify any faults and erase event memories ⇒ Vehicle diagnostic tester.

Tightening torques

Component		Nm
Screws or nuts	M6	9
	M7	13
	M8	20
	M10	40
	M12	70
deviations:		
Engine/gearbox connecting screws ⇒ Rep. gr. 34 ; Manual gearbox if applicable ⇒ Rep. gr. 37 ; Automatic gearbox		
Screws for assembly bracket ⇒ page 19		

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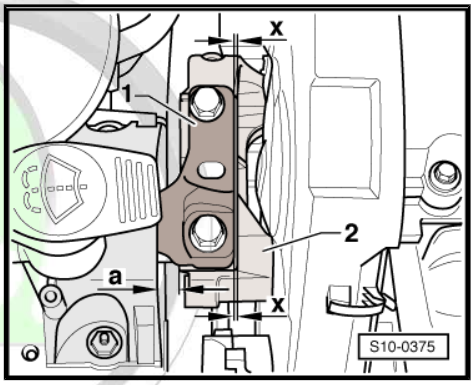
1.4 Checking and adjusting the assembly bracket

1.4.1 Checking the assembly bracket

– Check dimensions on the right hanger for engine/gearbox unit:

- Between engine bracket and engine support there must be a distance -a- of 10 ... 13 mm.
- The cast iron edge on the engine support -2- must be parallel to the supporting arm -1- the dimension -x- must be the same at the front and rear.



Note

The distance -a- can be checked, for example with suitable round bars.

Only if there is an acoustic complaint (engine or gearbox knock on the frame side rail when cornering) and the dimension -a- is outside 10 … 13 mm:

– Adjust the assembly bracket ⇒ page 17 .

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1.4.2 Adjusting the unit mounting

Special tools and workshop equipment required

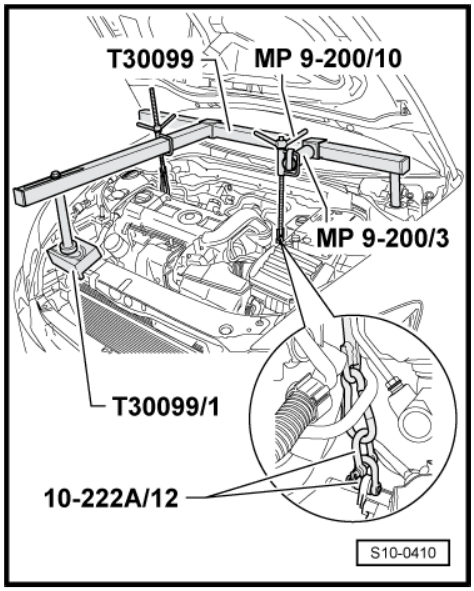
- ♦ Supporting device - T30099-
- ♦ Base - T30099/1-
- ♦ Adapter - MP9-200/3 (10-222A/3)-
- ♦ Hook - MP9-200/10 (10-222A/10) -
- ♦ Lifting eye - 10-222A/12-

– Remove battery and battery tray ⇒ Rep. gr. 27 ; Electrical System .

– Remove the cooling water tank cover ⇒ Rep. gr. 66 ; Body Work .

– Install adapter - MP9-200/3 - with two hooks - MP9-200/10 - on the support bracket - T30099- as shown in the figure.

– Position the support bracket - T30099- with base - T30099/1- and secure the engine in the installation position with the shackle - 10-222A/12 - .

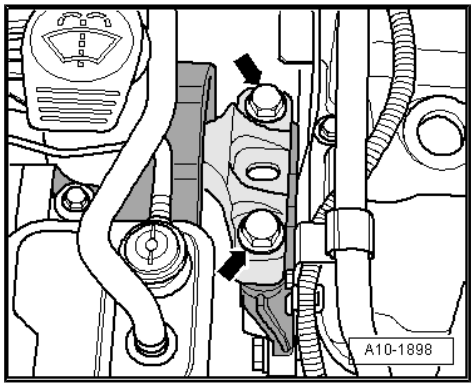


Note

The figure points towards the 1.4 litre engine.

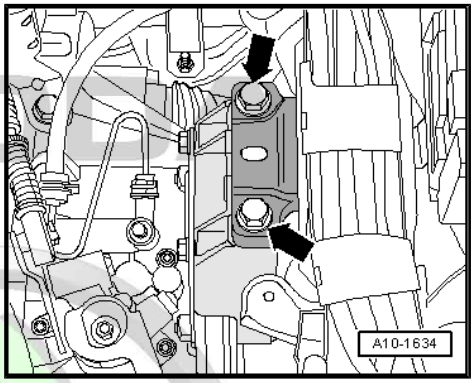
– Uniformly pre-tension the engine/gearbox unit with both spindles, but do not raise.

– Release the screws -arrows- of the assembly bracket at the engine.



– Slightly loosen the screws -arrows- of the assembly bracket at the gearbox (less than 1 revolution).

– Successively replace all the screws of the assembly bracket (as long as it has not already been performed when installing the engine) and insert these loosely.



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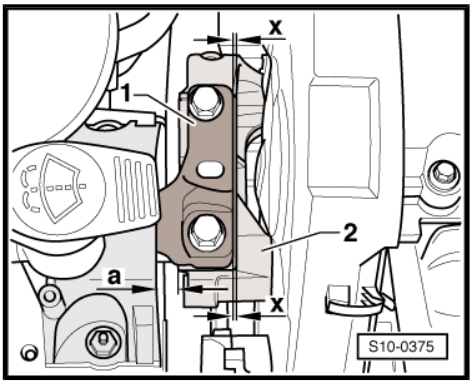
– Move the engine/gearbox assembly with an assembly lever between engine support -2- and supporting arm -1- for engine mount until the following dimensions are set:

• Between engine bracket and engine support there must be a distance -a- of 10 mm.

• The cast iron edge on the engine support -2- must be parallel to the supporting arm -1- the dimension -x- must be the same at the front and rear.



Note

The distance -a- = 10 mm can be checked e.g. with suitable round bars.

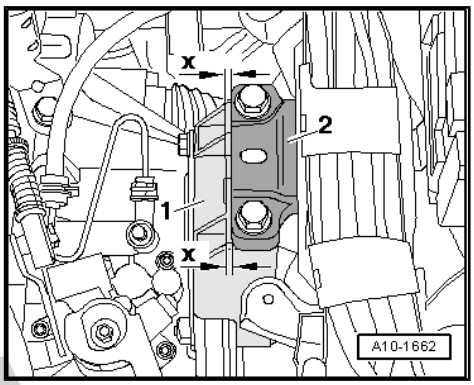
– Tighten the screws for the engine side assembly bracket ⇒ page 19 .

– Make sure that on the gearbox side the edges of the supporting arm -2- and gearbox support -1- are parallel.

• The dimension -x- must be the same on both mount sides.

– Tighten the screws for the gearbox side assembly bracket ⇒ page 19 .

Further installation occurs in reverse order.



1.5 Assembly bracket

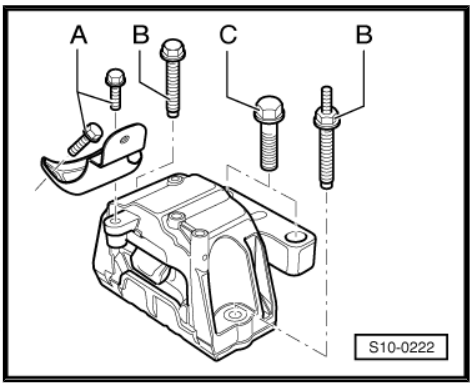
Tightening torques

Assembly bracket - engine

A - 20 Nm + torque a further 90° ($^1/_4$ turn) - replace

B - 40 Nm + torque a further 90° ($^1/_4$ turn) - replace

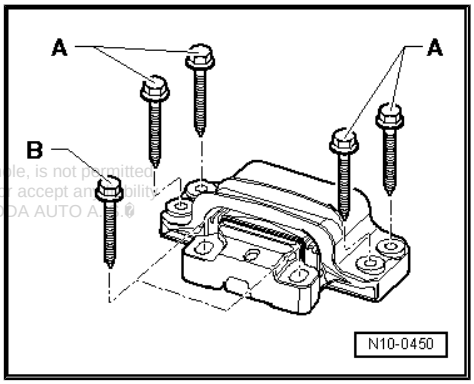
C- 60 Nm + a further 90° ($^1/_4$ turn) - replace



Assembly bracket - gearbox

A - 40 Nm + a further 90° ($^1/_4$ turn) - replace

B- 60 Nm + a further 90° ($^1/_4$ turn) - replace



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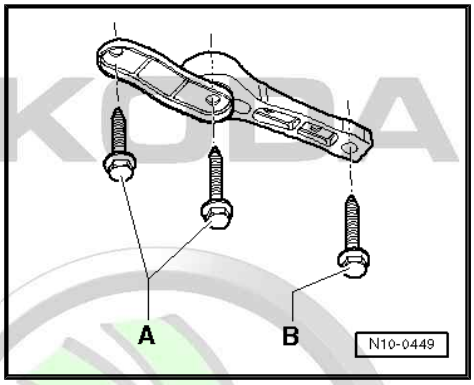
Pendulum support

A - 50 Nm + a further 90° ($^1/_4$ turn) - replace

B- 100 Nm + a further 90° ($^1/_4$ turn) - replace

Removing: First unscrew screw -B-, then screw -A-.

Installing: First tighten screw -A-, then screw -B-.



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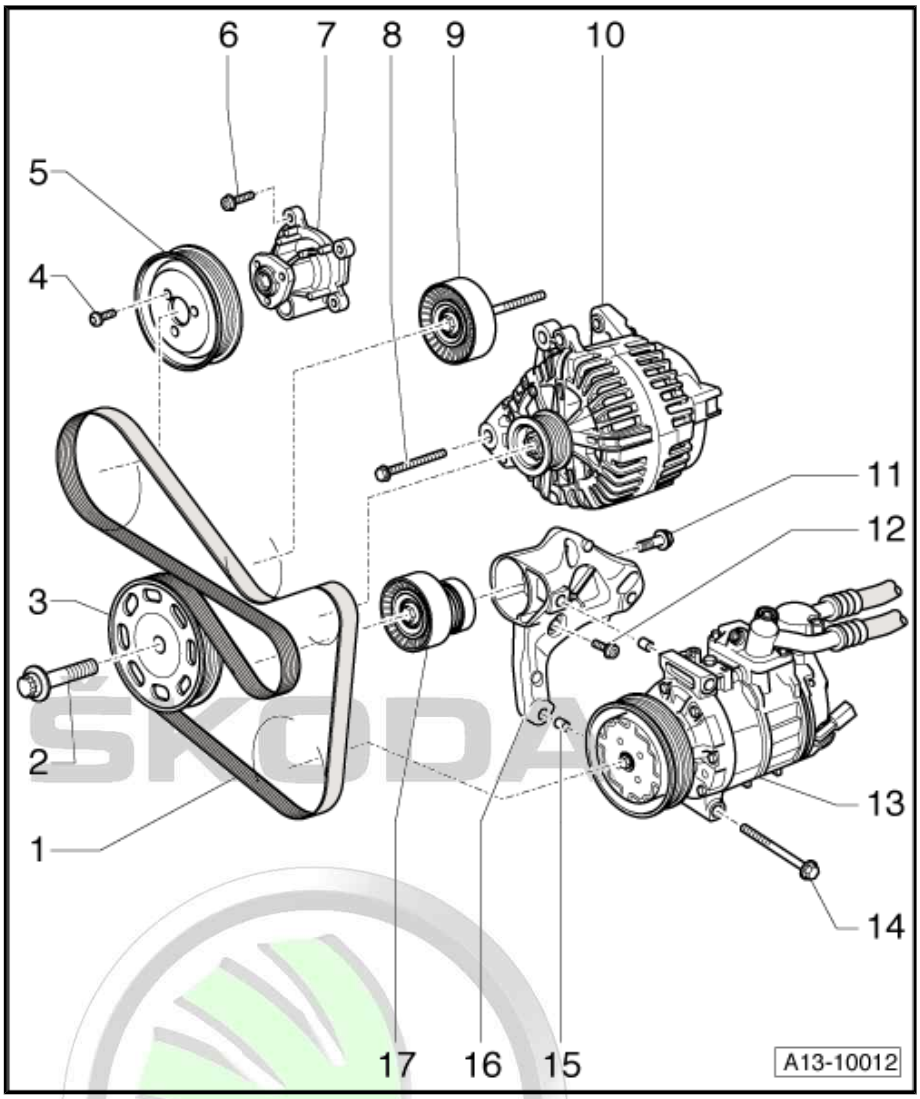
13 – Crankshaft group

1 Cylinder block - Belt pulley side

1.1 V-ribbed belt drive - Summary of components



1 - V-ribbed belt

- ❑ mark the direction of rotation with chalk or a felt-tip pen before removing
- ❑ check for wear
- ❑ do not kink
- ❑ removing and installing ⇒ page 22

2 - Fixing screw

- ❑ for vibration damper
- ❑ replace
- ❑ The contact surface of the fixing screw must be free of grease and oil.
- ❑ order of tightening ⇒ page 35
- ❑ When loosening and tightening counterhold the belt pulley with the counterholder - T30004 (3415)- with bolts - T30004/1 (3415/1)- .

3 - Vibration damper

- ❑ Contact surfaces must be free of oil and grease
- ❑ Installing and removing the vibration damper ⇒ page 35

4 - 20 Nm

- ❑ When loosening and tightening, counterhold with the wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- to this end rework wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- ⇒ page 103

5 - Belt pulley for coolant pump:

- ❑ removing and installing ⇒ page 103

6 - 9 Nm

7 - Coolant pump

- ❑ removing and installing ⇒ page 103

8 - 25 Nm

9 - Guide pulley, 40 Nm

10 - Generator

- ❑ removing and installing ⇒ Rep. gr. 27 ; Electrical System

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- ❑ to facilitate the positioning of the AC generator, drive the threaded bushings for screws at the generator backwards slightly

11 - 20 Nm + torque a further 90° (1/4 turn)

- ❑ replace

12 - 25 Nm

13 - AC compressor

- ❑ removing and installing ⇒ Rep. gr. 87 ; Heating, Air Conditioning

14 - 25 Nm

15 - Fitting sleeve

16 - Bracket for AC compressor

17 - Tensioning device for V-ribbed belt

- ❑ swivel tensioning device for V-ribbed belt with wrench to slacken the V-ribbed belt
- ❑ Secure the tensioning device using a 4 mm external hexagonal key
- ❑ to remove, undo screw (-Pos. 11-)

1.2 Removing and installing V-ribbed belt

Removing

– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .

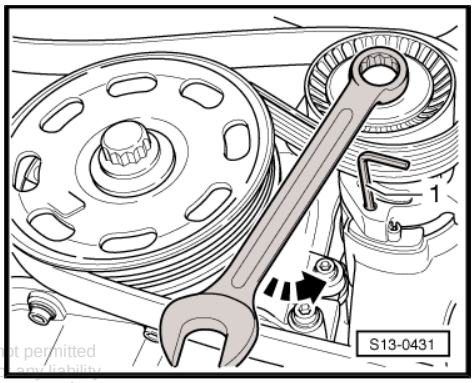
– Remove the right wheelhouse liner bottom part ⇒ Rep. gr. 66 ; Body Work .

– Mark the rotation direction of the V-ribbed belt.

– Release the V-ribbed belt by swivelling the tensioning device with an SW 16 ring spanner -in direction of arrow-.

– Secure tensioning device with 4 mm hexagon wrench -1-.

– Remove poly V-belt.



Install

Installation is carried out in the reverse order. When installing, observe the following:

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Routing of the V-ribbed belt with AC compressor

1 - Belt pulley - coolant pump

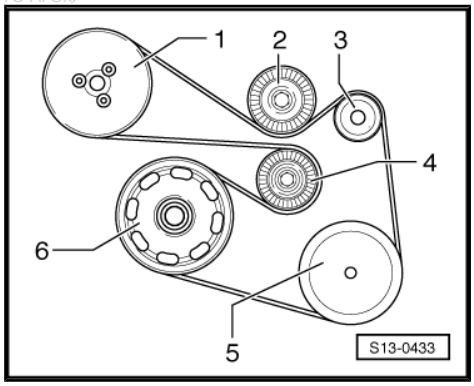
2 - Guide pulley

3 - Belt pulley for AC generator

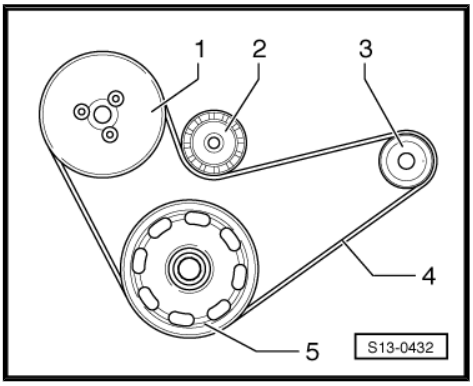
4 - Tensioning pulley

5 - AC compressor

6 - Vibration damper



Routing of the V-ribbed belt without AC compressor



1 - Belt pulley - coolant pump

2 - Tensioning pulley

3 - Belt pulley for AC generator

4 - V-ribbed belt

5 - Vibration damper

Note

- *Before fitting the V-ribbed belt make sure that all assemblies (AC generator, AC compressor, coolant pump) are securely mounted.*
- *Pay attention to the correct position and rotation direction of the V-ribbed belt in the belt pulley when installing it.*

– First lay the V-ribbed belt on the vibration damper. Then shift the belt onto the tensioning roller.

Further installation occurs in a similar way in reverse order to removal.

– Start engine and check ribbed V-belt run.

1.3 Camshaft drive - Summary of components

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Caution

If considerable quantities of metal swarf or abrasion is found when carrying out an engine repair, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:

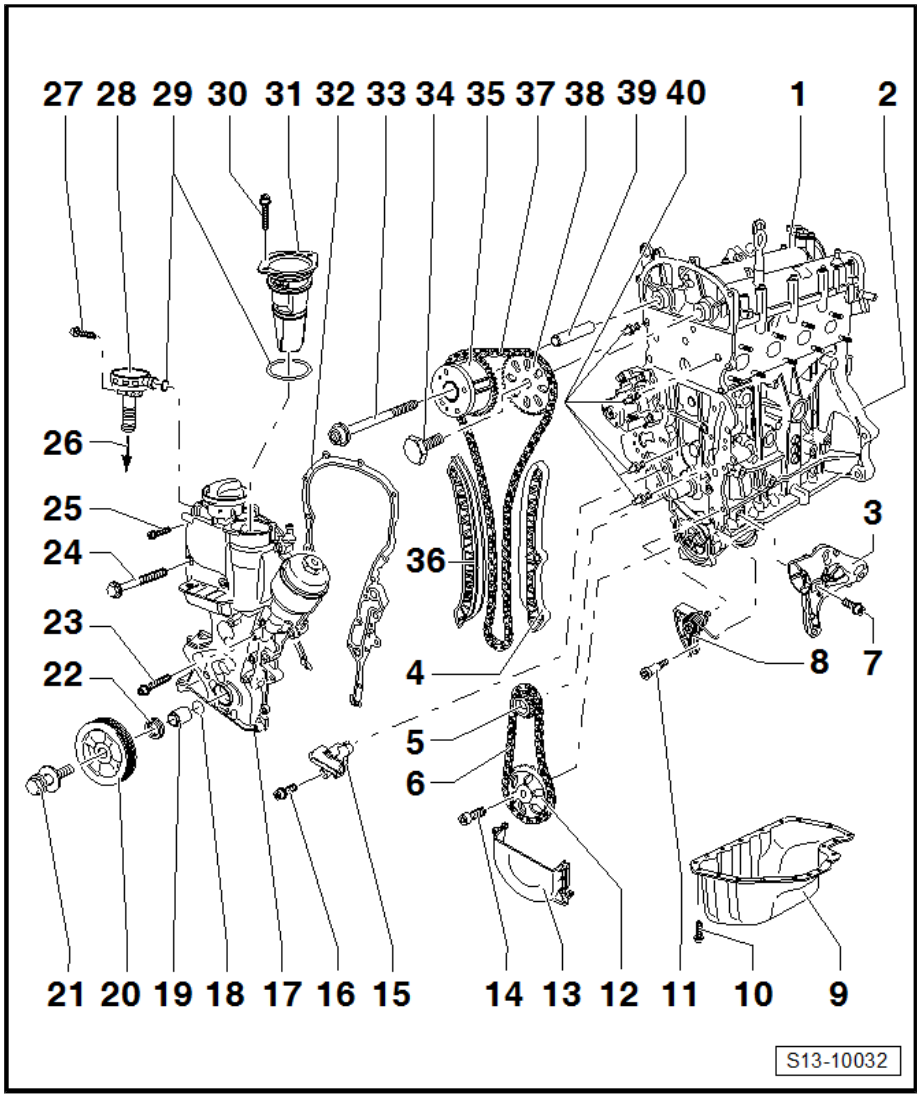
Carefully clean the oil galleries.

Replace engine oil cooler.

Replace oil filter element.

Note

Before assembly, oil all bearing and contact surfaces.



1 - Cylinder head with camshaft housing

- ❑ removing and installing ⇒ page 68
- ❑ Camshaft housing with integrated camshaft bearings
- ❑ The sealing surface of camshaft housing and sealing surface of top side of cylinder head must not be machined

2 - Cylinder block

- ❑ made out of aluminium - summary of components ⇒ page 31
- ❑ Piston and connecting rod - Summary of components ⇒ page 45

3 - Support

- ❑ for tensioning device and AC compressor

4 - Sliding rail

- ❑ for timing chain

5 - Sprocket

- ❑ for oil pump drive and timing chain
- ❑ Contact surfaces must be free of oil and grease
- ❑ removing and installing ⇒ page 58

6 - Drive chain

- ❑ for oil pump
- ❑ mark running direction (installed position) before removing
- ❑ removing and installing ⇒ page 58

7 - 25 Nm

8 - Chain tensioner

- ❑ for oil pump drive
- ❑ only be replaced as a complete unit

9 - Oil pan

- ❑ removing and installing ⇒ page 85

10 - 13 Nm

11 - Carrier bolt for tightener, 15 Nm

12 - Sprocket

- ❑ for oil pump
- ❑ Counterhold sprocket with counterholder - T10172-

13 - Cover

14 - 20 Nm + torque a further 90° (1/4 turn)

- ❑ replace

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15 - Chain tensioner

16 - 9 Nm

17 - Timing case

- ❑ removing and installing ⇒ page 26
- ❑ to facilitate installation, screw two pin screws -M6x80- into the camshaft housing and the cylinder block
- ❑ to better guide the timing case, position the oil pan with two screws

18 - O-ring

- ❑ replace
- ❑ in the distance sleeve -Position 19-

19 - Distance sleeve

- ❑ Contact surfaces must be free of oil and grease
- ❑ install with new O-ring -Position 18-

20 - Vibration damper

- ❑ Contact surfaces must be free of oil and grease.
- ❑ Installing and removing the vibration damper ⇒ page 35

21 - Fixing screw

- ❑ for vibration damper
- ❑ replace
- ❑ The contact surface of the fixing screw must be free of grease and oil.
- ❑ tighten ⇒ page 35

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22 - Gasket ring for crankshaft in timing case

- ❑ replace ⇒ page 33

23 - 10 Nm

- ❑ M6x45 mm

24 - 50 Nm

25 - 10 Nm

- ❑ M6x22 mm

26 - To intake manifold

27 - 10 Nm

28 - Pressure relief valve (PCV valve)

- ❑ with ventilation hose

29 - O-ring

- ❑ replace

30 - 10 Nm

31 - Oil separator

32 - Gasket

- ❑ replace

33 - 40 Nm + torque a further 90° (1/4 turn)

- ❑ replace
- ❑ Screw with left-hand thread
- ❑ Counterhold camshaft adjuster with counterholder - T10172 -

34 - 50 Nm + torque a further 90° (1/4 turn)

- ❑ replace
- ❑ Counterhold sprocket with counterholder - T10172-

35 - Camshaft adjuster

- ❑ must not be disassembled
- ❑ removing and installing ⇒ page 58

36 - Tensioning rail

37 - Timing chain

- ❑ removing and installing ⇒ page 58

38 - Sprocket

- ❑ For exhaust camshaft.
- ❑ removing and installing ⇒ page 58

39 - Guide bushing

40 - Guide bolt

- ❑ Tightening torque: 20 Nm

1.4 Removing and installing the timing case

Special tools and workshop equipment required

- ♦ Supporting device - T30099-
- ♦ Base - T30099/1-
- ♦ Counterholder - T30004 (3415)-
- ♦ Bolt - T30004/1 (3415/1)-
- ♦ Hook - MP9-200/10 (10-222A/10) -
- ♦ Catch pan , e.g. -VAS 6208-
- ♦ Sealant - D 176 501 A1-
- ♦ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ♦ Cleaning and degreasing agent , e.g. -D 009 401 04-

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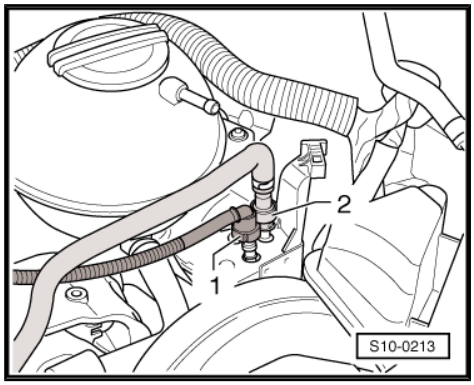
Removing

– Remove engine trim panel with air filter ⇒ page 145 .

– Unscrew pressure relief valve (PCV valve).

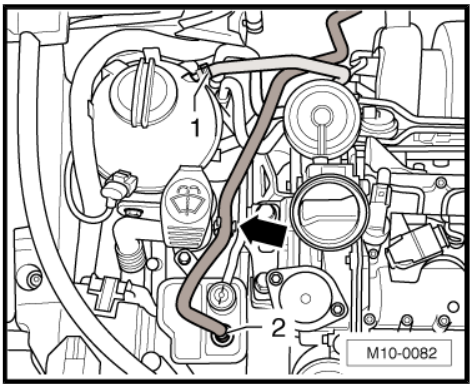
– Disconnect vent line -1-. To do so press the circlip.



– Disconnect bleeder hose from activated charcoal filter -2- and washer fluid reservoir -arrow- and expose.
– Remove activated charcoal filter and bracket.
– Remove the expansion reservoir and lay it to one side.

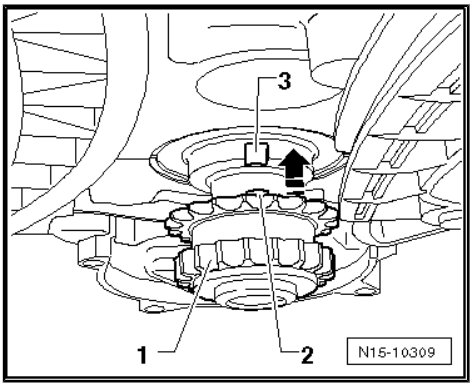
  The coolant hoses remain connected.

– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .
– Remove the front right wheelhouse liner ⇒ Rep. gr. 66 ; Body Work .
– Remove vibration damper ⇒ page 35 .



Note

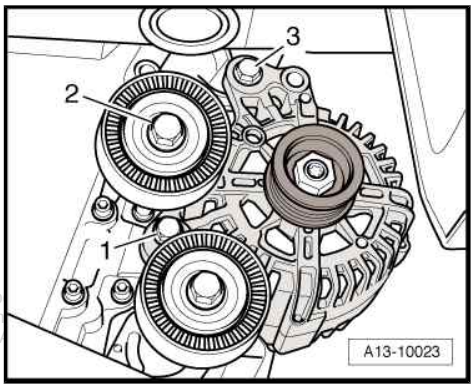
- *Risk of engine damage.*
- *In order to avoid that the chain sprocket on the crankshaft slides out of the driver, the crankshaft must not be turned when the V-ribbed belt pulley is released.*
- *The integrated peg -2- of the chain sprocket -1- must fit into the slot -3- at the crankshaft stub.*



– Remove belt pulley from the coolant pump ⇒ page 103 .
– Remove AC compressor with the refrigerant lines connected from the bracket ⇒ page 21 .

  Observe instructions for assembly work on the air-conditioning system ⇒ page 5 .

– Remove the mounting bracket for tensioner link and for AC compressor.
– Remove AC generator and guide roller -2- ⇒ Rep. gr. 27 ; Electrical System .
– Removing the oil pan ⇒ page 85 .



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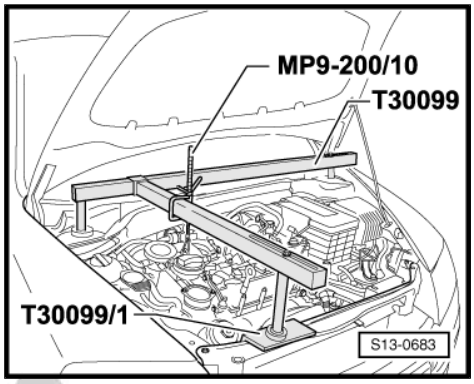
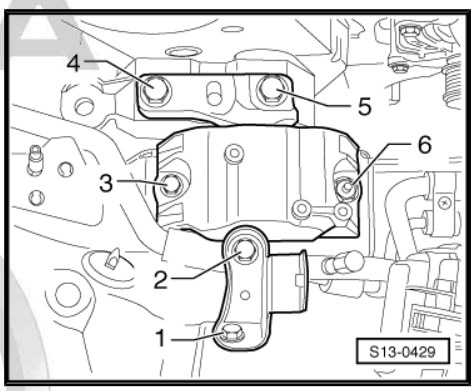
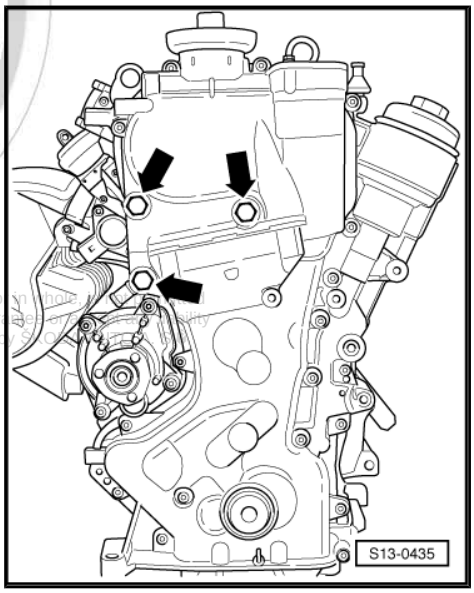
– Attach the hook - MP9-200/10 - to the support bracket - T30099- , as shown in the figure.
– Position support bracket - T30099- with base - T30099/1- and suspend hook of spindle in the lifting eye.
– Pre-tension the engine.



– Release screws -1...6- and remove engine mounting.



– Release the Allen screws of the control unit and the screws marked with the -arrows-.
– Place a catch pan under the engine.
– Remove timing case. To do so if necessary slightly raise engine.



Note

Make sure that the bushing for the crankshaft remains in the timing case.

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– Drive gasket ring for crankshaft out of the timing case.

Install

Condition

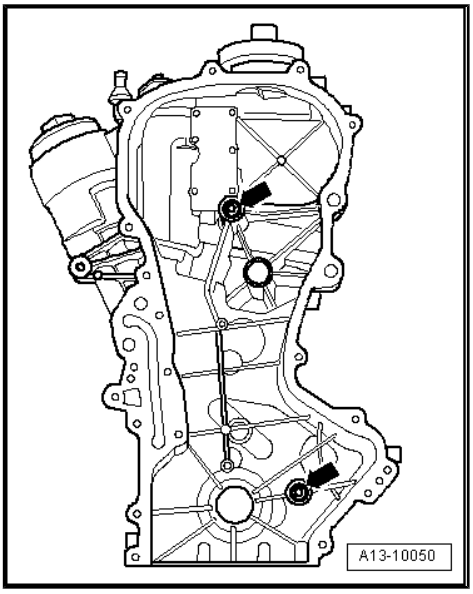
- Timing o.k.

WARNING

Wear protective gloves and goggles when working with gasket remover and degreasing agent!

– Remove residual sealant on the sealing surfaces with chemical sealant remover.
– Degrease the sealing surfaces.

– Insert new gasket rings -arrows- onto the inner side of the timing case.



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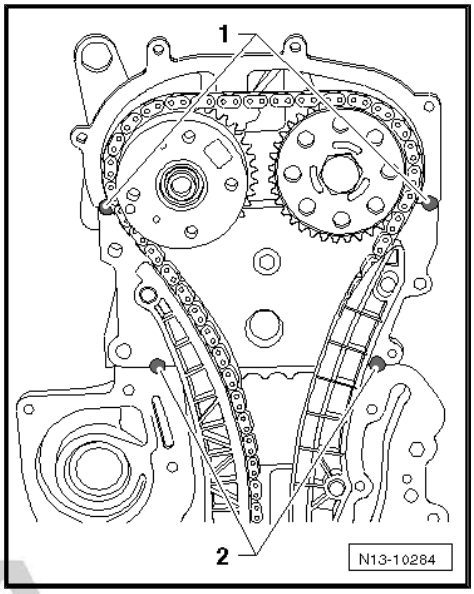

Note

- *The timing case is sealed to the engine with a seal and additionally with the sealant - D 176 501 A1- .*
- *Avoid the sealant - D 176 501 A1- should prevent leak-tightness between the timing case and the joints -1- and -2-.*
- *The sealant points must have a diameter of 10 mm and must be approx. 1 mm thick.*
- *Only apply the sealant immediately before installing the timing case.*

– Apply the sealant - D 176 501 A1- to the joints of the camshaft housing/cylinder head -1- and the cylinder head/cylinder block -2-.

– Carefully place the new gasket onto the dowel pins.

– For better guidance, screw two pin screws M6x80 into the cylinder head and the cylinder block.

– To improve the guide, fit the oil sump without the silicone sealant with 4 screws.

– Press timing case onto the pin bolts and fitted pins and onto the cylinder block.

Make sure that the timing case does not tilt.

– Tighten diagonally and evenly the fixing screws of the timing case.

Tightening torque for screws M6: 10 Nm

Tightening torque for screws M10: 50 Nm

– Install engine mount ⇒ page 19 .

– Installing the oil pan ⇒ page 85 .

– Installing the gasket ring for the crankshaft ⇒ page 33 .

Further installation occurs in reverse order to removal. Pay attention to the following:

Note

Install the vibration damper ⇒ page 35 .

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2 Cylinder block, sealing flange and flywheel

2.1 Cylinder block made of aluminium- Summary of components

WARNING

The crankshaft must not be removed. Merely releasing the crankshaft bearing cover screws will result in deformations of the bearing pedestals of the cylinder block. This deformation will cause a reduction of the bearing clearance. If the bearing shells are not renewed bearing damage could occur due to a different bearing clearance.

If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.

Measuring the main bearing clearance is not possible with normal workshop equipment.

Note

Repairs to the clutch ⇒ Rep. gr. 30 ; Gearbox .

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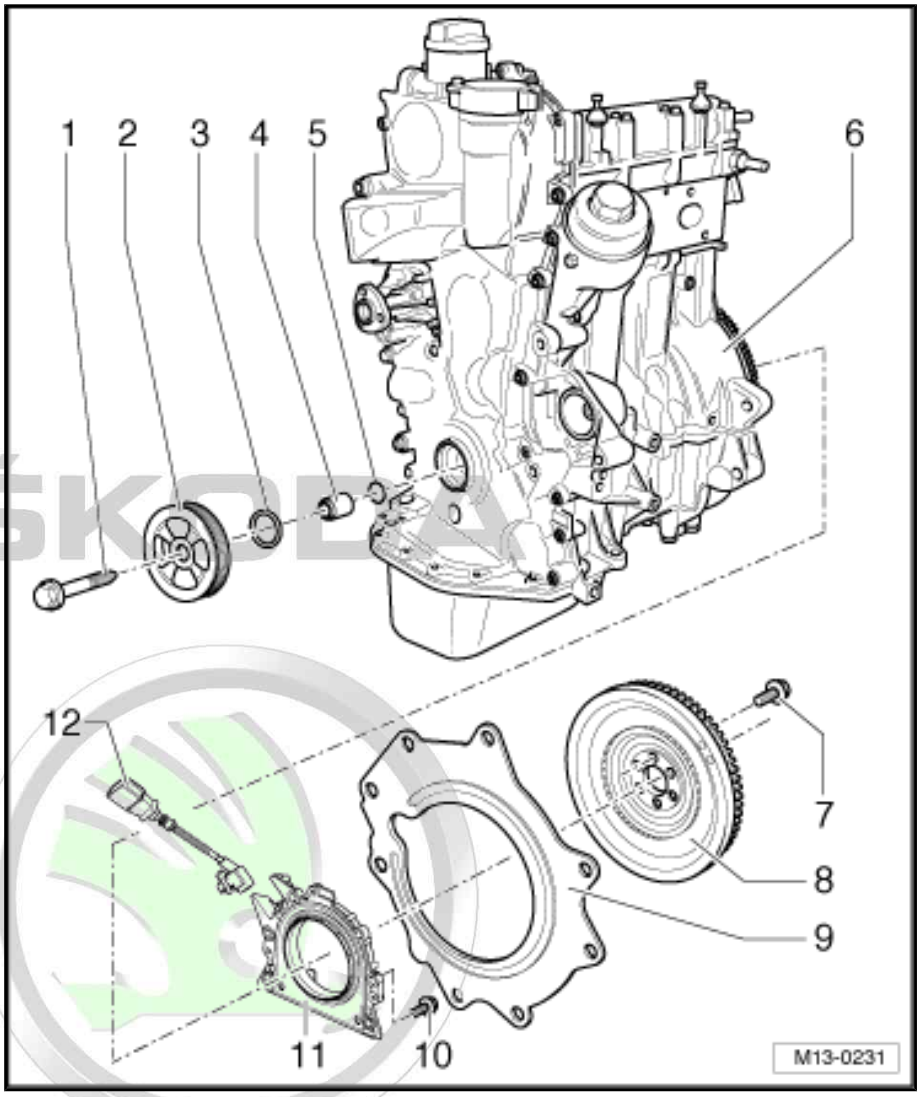

1 - Fixing screw

- ❑ for vibration damper
- ❑ replace
- ❑ The contact surface of the fixing screw must be free of grease and oil.
- ❑ tighten ⇒ page 35

2 - Vibration damper

- ❑ Contact surfaces must be free of oil and grease.
- ❑ Removing and installing V-ribbed belt ⇒ page 22

3 - Gasket ring for crankshaft in timing case

- ❑ replace ⇒ page 33

4 - Distance sleeve

- ❑ Contact surfaces must be free of oil and grease
- ❑ install with new O-ring -Position 5-

5 - O-ring

- ❑ replace
- ❑ in the distance sleeve -Position 4-

6 - Cylinder block made of aluminium

7 - 60 Nm + torque a further 90° (1/4 turn)

- ❑ replace

8 - Flywheel/drive plate

- ❑ For removing and installing the flywheel use flywheel lock - MP 1-504- (fit onto starter ring gear if the engine is fastened in the engine mount - MP 1-202- at the assembly stand)
- ❑ removing and installing driver disc ⇒ page 43

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9 - Intermediate plate

- ❑ must be positioned on dowel sleeves
- ❑ do not damage/bend during assembly work

10 - 10 Nm

- ❑ replace

11 - Sealing flange with rotor and gasket ring

- ❑ Renew complete with gasket ring and sender wheel only
- ❑ pay attention to different versions for manual gearbox and automatic gearbox ⇒ page 36
- ❑ replace ⇒ page 36

12 - Engine speed sender - G28-

- ❑ with captive screw
- ❑ Tightening torque: 5 Nm
- ❑ different versions; according to gearbox
- ❑ removing and installing ⇒ page 33

2.2 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

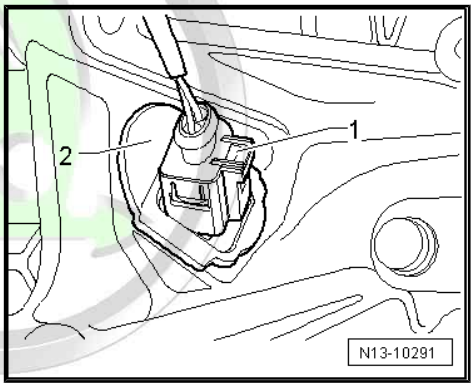
- Socket insert - T10370-

Removing

Fitting position of the engine speed sender is located underneath the intake manifold at the sealing flange for the crankshaft -on the fly wheel side-.

– Disconnect the plug connection -1- for engine speed sender - G28- .

– Take out the gasket -2- from the cylinder block and remove the engine speed sender - G28- with the socket insert - T10370- .



Install

Further installation occurs in reverse order to removal.

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2.3 Replacing crankshaft seal on belt pulley side

Special tools and workshop equipment required

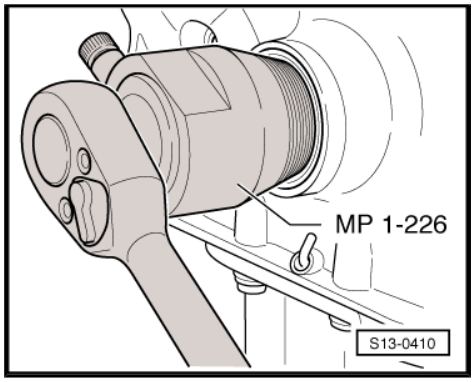
- Gasket ring extractor - MP 1-226 (3203)-
- Assembly device - T10117/2-
- Assembly device - T10117-
- Counterholder - T30004 (3415)-
- Bolt - T30004/1 (3415/1)-

Removing

– Remove vibration damper ⇒ page 35 .

– Unscrew inner part of the gasket ring extractor - MP 1-226- three turns (approx. 5 mm) out of the outer part and lock with knurled screw.

– Oil the thread head of the gasket ring extractor - MP 1-226 - , position and forcefully screw it into the gasket ring as far as possible.
– Release knurled screw and turn the inner side against the crankshaft until the gasket ring is pulled out.
– Remove the bearing axle from the crankshaft journal and clean the contact surface of the crankshaft chain sprocket.



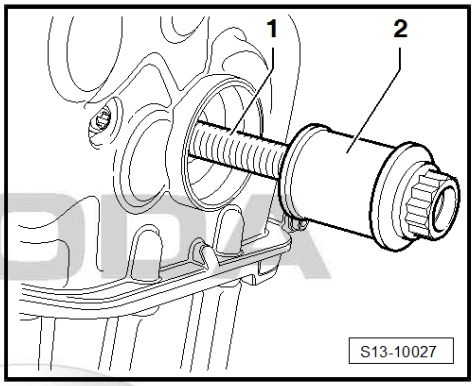
Install

Note

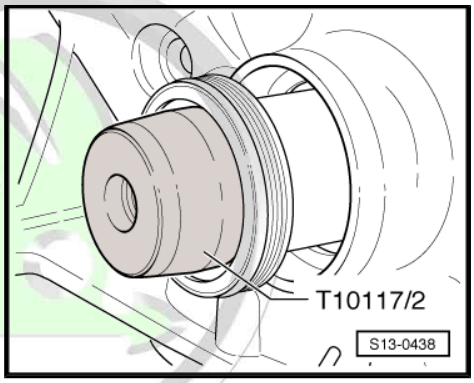
Make sure that the clamping surfaces of the fixing screw, the belt pulley, the distance sleeve and the crankshaft chain sprocket are free of oil and grease.

– Replace the O-ring in the distance sleeve -Pos. 5- ⇒ page 31 .

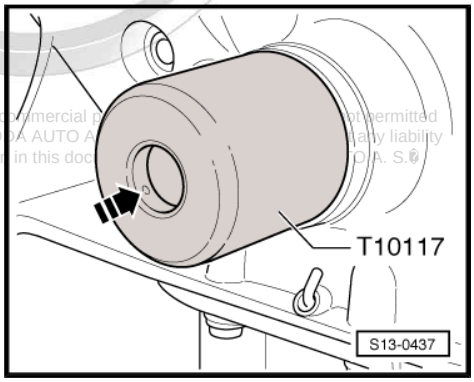
– First, slide distance sleeve -2- onto fixing screw -1-.
– Screw the fixing screw -1- by about 2 turns into the crankshaft.
– Slide the distance sleeve -2- onto the crankshaft journal as far as it will go.
– Release fixing screw (at the same time press the distance sleeve against the crankshaft).



– Position the assembly device - T10117/2- in front of the distance sleeve and slide the gasket ring onto the distance sleeve.
– Remove the assembly device - T10117/2- from the distance sleeve.



– Press the gasket ring with the assembly device - T10117- by striking uniformly up to the stop in the timing case.
– Install the vibration damper ⇒ page 35 .
– Install the V-ribbed belt ⇒ page 22 .



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2.4 Installing and removing the vibration damper

Special tools and workshop equipment required

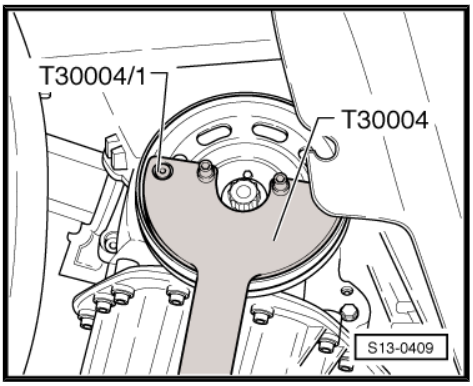
- Counterholder - T30004 (3415)-
- Bolt - T30004/1 (3415/1)-

Removing

– Remove V-ribbed belt ⇒ page 22 .

– Counterhold vibration damper with counterholder - T30004 - and bolt - T30004/1- .

– Unscrew fixing screw and remove vibration damper.



Install

Note

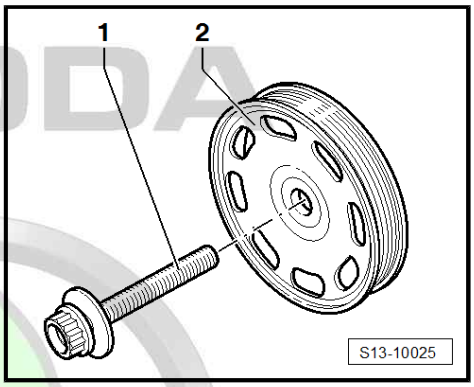
Make sure that the clamping surfaces of the fixing screw, the belt pulley, the distance sleeve and the crankshaft chain sprocket are free of oil and grease.

Conditions

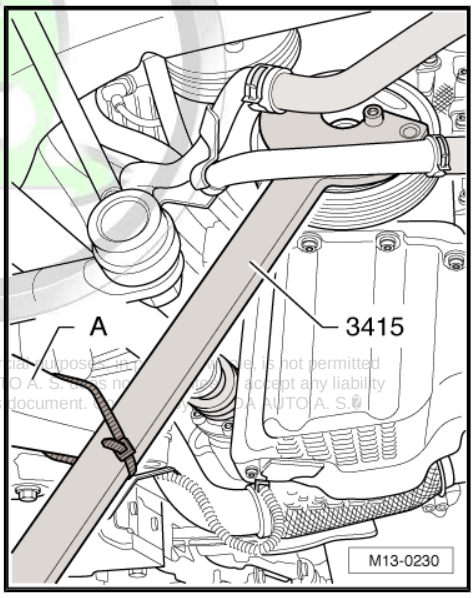
- Timing o.k.

– Slightly oil the first third of the thread of the new fixing screw -1-.

– Place belt pulley -2- with the new fixing screw -1- onto the crankshaft journal.



– Insert counterholder - 3415- and the bolts - 3415/1- into the holes of the vibration damper, support counterholder at track control arm -A- and secure in this position with a cable strap. Tighten cable strap.



Note

Make sure that the track control arm is not damaged.

– Tighten fixing screw for vibration damper in the 1st step as follows:

Tightening torque: 150 Nm

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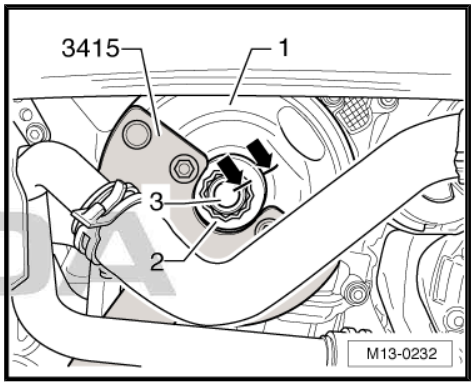
– Mark at this stage the position of the fixing screw -3- to the vibration damper -1- -arrows-. The marking must not be performed on the washer -2-, because it does not turn along when tightening.



– Tighten fixing screw for vibration damper in the 2nd step as follows:

Torque screw a further 180° (1/2 turn).

Tightening may occur in successive stages.

– Test timing ⇒ page 52 .

If the timing is not correct:

– Adjusting valve timing ⇒ page 53 .

If the timing is correct:

– Install the V-ribbed belt ⇒ page 22 .

2.5 Replacing the sealing flange for crankshaft - gearbox side

Special tools and workshop equipment required

- Assembly fixture - T10017- or -T10134-
- 3 hexagon screws M6x35 mm
- Feeler gauge
- Steel straightedge

2.5.1 Distinguishing features of the sealing flange of the assembly devices - T10017- and -T10134-

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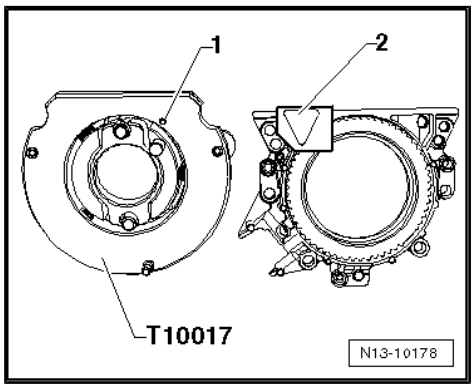
Note

- *Note that different sealing flanges may be installed depending on what transmission was used ⇒ ETKA - Electronic Catalogue of Original Parts .*
- *Use the corresponding assembly device for the relevant sealing flange.*

Install sealing flange for automatic gearbox with assembly device - T10017-

1 - Dowel pin

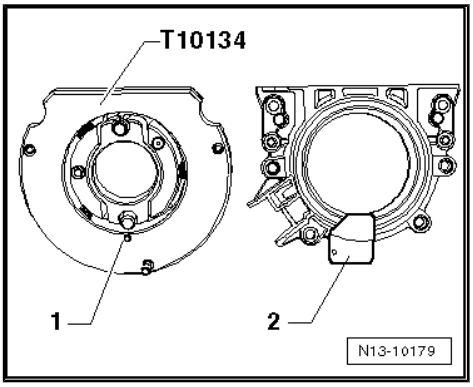
2 - Transport security (remove immediately before assembly)



Install sealing flange for manual gearbox with assembly device - T10134-

1 - Dowel pin

2 - Transport security (remove immediately before assembly)

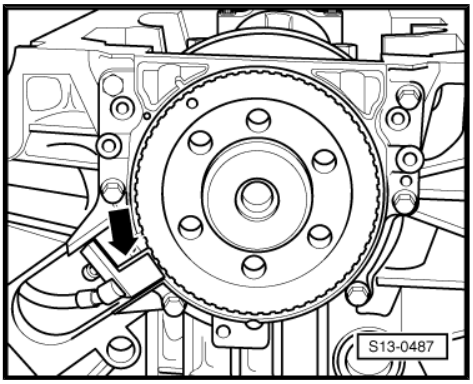


2.5.2 Removing sealing flange with rotor

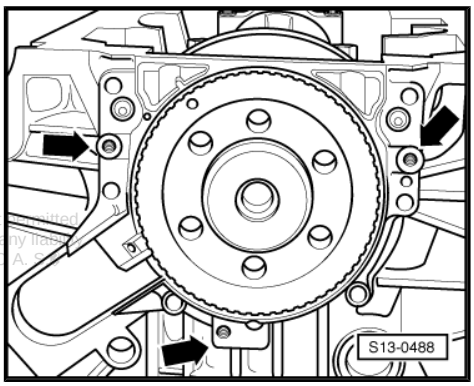
Note

These work sequences with the engine removed are shown for purposes of clear presentation. The work sequences are identical with the engine installed and gearbox removed.

– Remove flywheel, if necessary drive plate.
– Remove intermediate plate.
– Position crankshaft to TDC for cylinder 1 ⇒ page 52 .
– Removing the oil pan ⇒ page 85 .
– Remove engine speed sender -arrow-.
– Release the fixing screws of the sealing flange.



– Screw in 3 M6 x 35 mm screws into the threaded bores of the sealing flange -arrows-.
– Press out sealing flange together with rotor from the crankshaft by alternately screwing the screws into the sealing flange.



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2.5.3 Installing sealing flange with rotor

Note

- *The sealing flange with a PTFE seal is equipped with a sealing lip support ring. This support ring serves as a fitting sleeve and must not be removed prior to installation.*
- *Do not separate or turn the sealing flange and rotor after removing them from the spare part package.*
- *The rotor is put in its installation position by placing it onto the positioning pin of the assembly device - T10017- or - T10134- .*
- *The rotor has an elastomer layer on its sealing surface with the crankshaft. This layer must not be brought into contact with dirt or grease.*
- *Sealing flange and oil seal form one unit and must only be renewed together with the sender wheel.*
- *The assembly device - T10017- or -T10134- is located in its installation position in relation to the crankshaft by a guide bolt, which is guided into the threaded bore of the crankshaft.*
- *Unless otherwise indicated, the method for the assembly device - T10017- and -T10134- is identical.*

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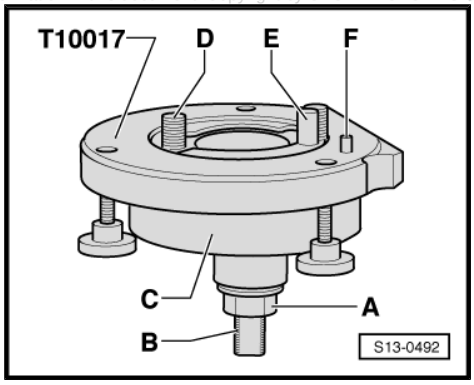
Assembly device - T10017- or -T10134-

A - Hexagon nut

B - Clamping surface

C - Assembly cup

D - Allan screw

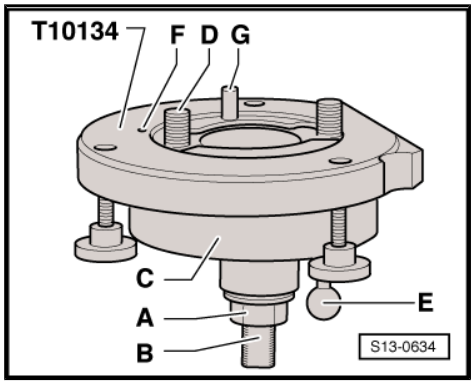


E - Guide bolts (for the assembly device - T10134- with red handle - for petrol engine)

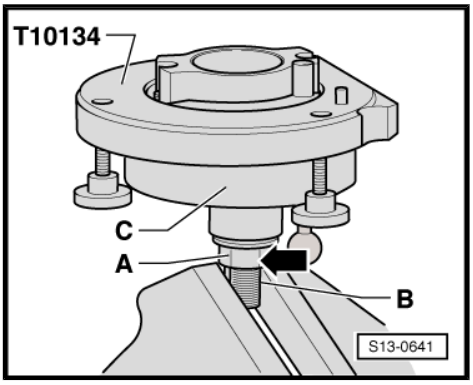
F - Positioning pin

G - Guide bolts (for the assembly device - T10134- with black handle - for diesel engine)

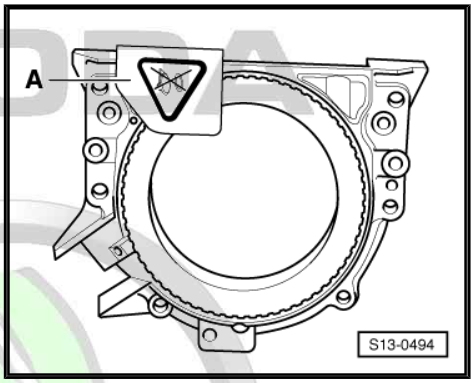
A - Mount sealing flange with sensor rotor onto assembly device - T10017- or -T10134-



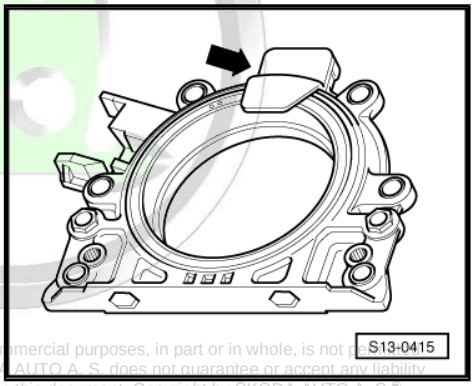
– Position nut -A- in the position tightly in front of the clamping surface -B- and grip assembly device - T10017- or -T10134- in the vice on the clamping surface -B- of the threaded spindle.



– Remove the circlip -A- from the new sealing flange for assembly device - T10017- .



or remove the securing clip -arrow- from the new sealing flange for assembly device - T10134- .



Note

Do not remove or turn the rotor from the sealing flange.

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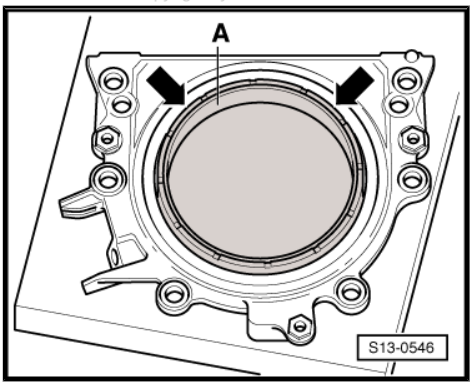
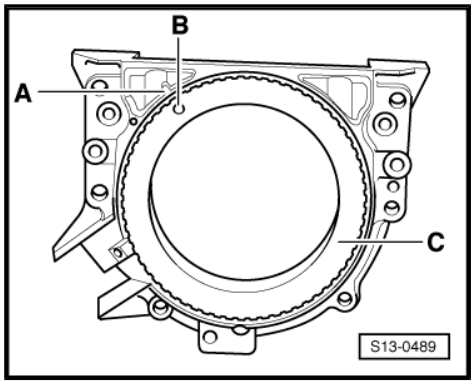
– Place sealing flange with front side facing down on a clean level surface.

– Press the sealing lip supporting ring -A- -arrows-, until it rests on the level surface.

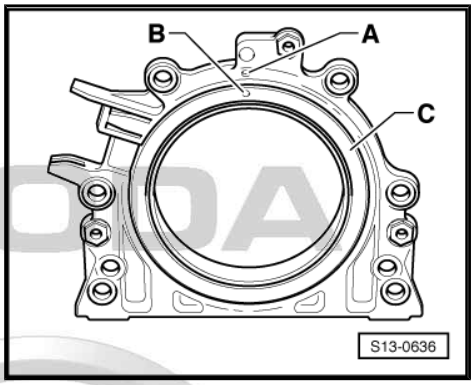
• The top edge of the rotor and the front edge of the sealing flange must be flush.



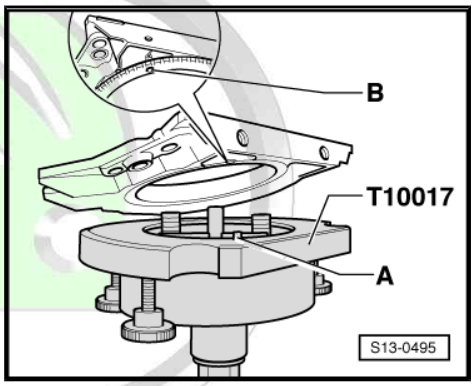
The locating hole -B- on the rotor -C- must be flush with the marking -A- on the sealing flange for assembly device - T10017-



or on the sealing flange for assembly device - T10134- .



– Sealing flange with the front side to the assembly device - T10017-



or place onto the assembly device - T10134- in such a way that the positioning pin -A- engages into the hole -B- of the rotor.

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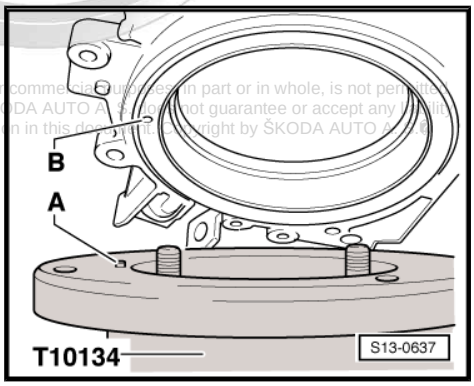
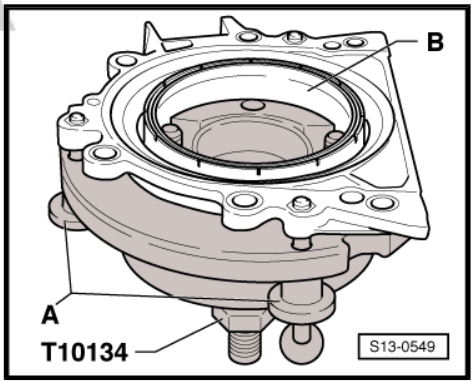


Note

Ensure sealing flange lies flat on assembly tool.

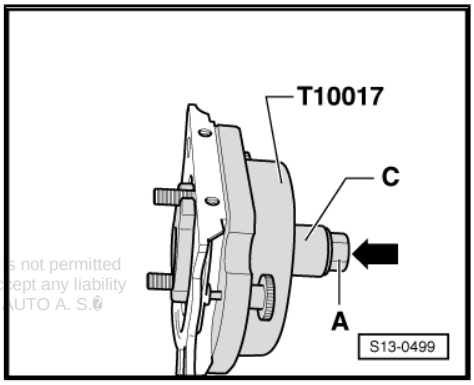
– When tightening the knurled screws -A- press the sealing lip supporting ring -B- on the surface of the assembly tool in such a way that the positioning pin cannot slide out of the rotor hole.



B - Mounting the assembly device - T10017- or -T10134- with sealing flange on the crankshaft flange

- The crankshaft flange must be free of grease and oil
- Crankshaft is at TDC for cylinder 1

– Unscrew hexagon nut -A- up to the end of the threaded spindle.



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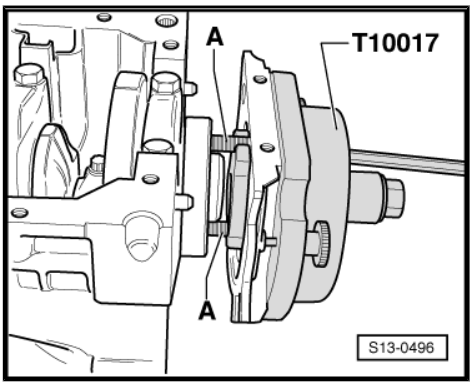
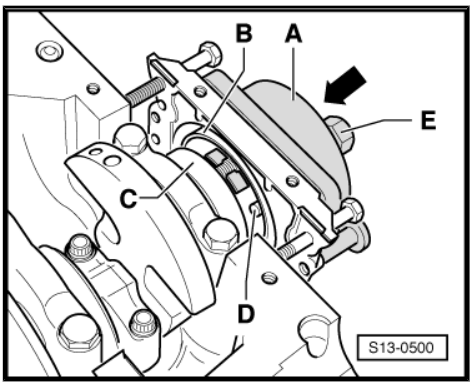
– Screw assembly device with Allan screws -A- up to the stop onto the crankshaft flange.
– Screw in two M6 x 35 mm screws by about 3 thread turns for the sealing flange guide into the cylinder block.



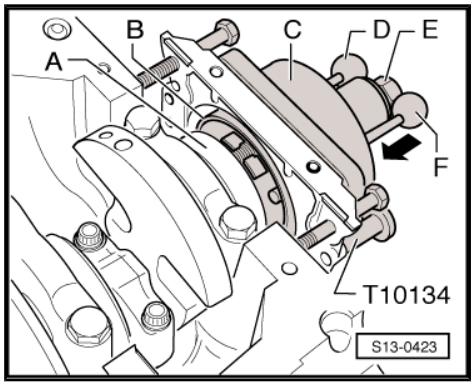
With the assembly device - T10017- :

– Move the assembly cup -A- by hand in the -direction of the arrow- until the rotor -B- rests on the crankshaft flange -C-. The guide bolts -D- on assembly device -T10017- must at the same time engage into the threaded bore of the crankshaft. This gives the rotor its final fitting location.



With the assembly device - T10134- :

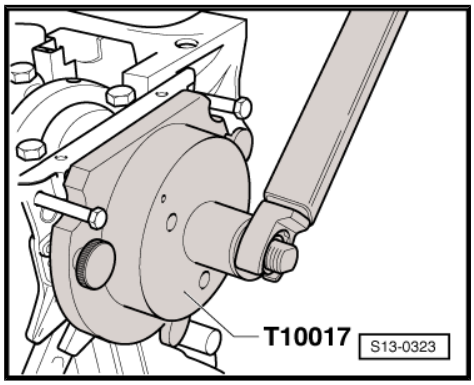
– Move the assembly cup -C- by hand in the -direction of the arrow- until the rotor -B- rests on the crankshaft flange -A-. Subsequently insert the guide bolt with red ball -F- fully into the threaded bore of the crankshaft. If the guide bolt is correctly pushed in, then the handle has a distance of approx. 10 mm from the assembly cup -C-. This gives the rotor its final fitting location.



C - Pressing the rotor with assembly device - T10017- or -T10134- onto the crankshaft flange

– Screw in hexagon nut by hand onto the threaded spindle until it rests against the assembly cup.

– Tighten the hexagon nut of the assembly tool using a torque wrench with adapter. Tightening torque: 35 Nm



Note

After tightening the nut to 35 mm there must still be a narrow air gap between the cylinder block and the sealing flange.

D - Inspecting the fitting position of the rotor on the crankshaft

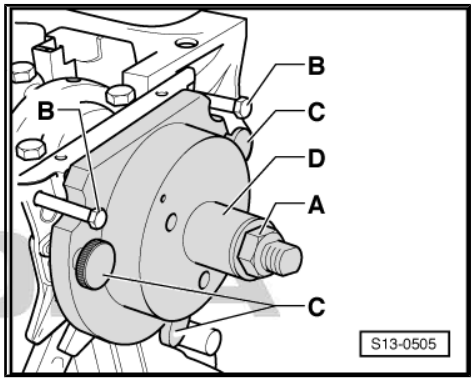
– Unscrew hexagon nut -A- up to the end of the threaded spindle.

– Unscrew two M6 x 35 mm screws -B- from the cylinder block.

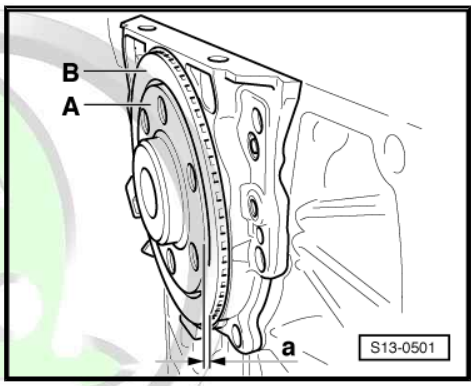
– Unscrew the three knurled screws -C- from the sealing flange.

– Unscrew two Allen screws and remove assembly device -T10017- or -T10134- .

– Remove sealing lip support ring.



The fitting position of the rotor on the crankshaft is accurate if there is a distance -a- of 0.5 mm between the crankshaft flange -A- and the rotor -B-.



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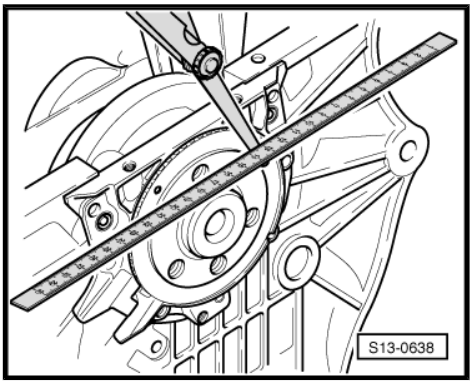
– Position the steel straight edge onto the crankshaft flange.
– Measure the distance between the steel straightedge and the rotor with a feeler gauge.

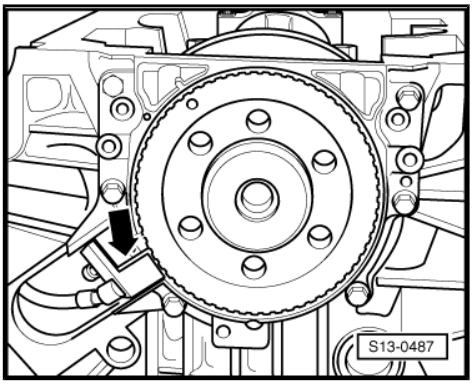


If the measured distance is less than 0.5 mm:

– Press down rotor ⇒ page 43 .

If the dimension is correct:

– Tighten the new fixing screws of the sealing alternately crosswise. Tightening torque: 10 Nm
– Install engine speed sender -arrow-. Tightening torque: 5 Nm
– Installing the oil pan ⇒ page 85 .
– Installing intermediate plate.
– Install the flywheel or driver disc with new screws.



E - Pressing down the rotor

– Screw assembly device - T10017- or -T10134- with Allen screws onto the crankshaft flange up to the stop.
– Screw in three knurled screws -A- into the flange.
– Subsequently insert the guide bolt with red ball -E- fully into the threaded bore of the crankshaft. If the guide bolt is correctly positioned, then the handle has a distance of approx. 10 mm from the assembly cup -B-.

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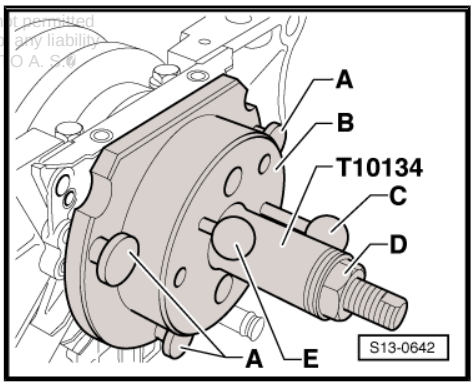
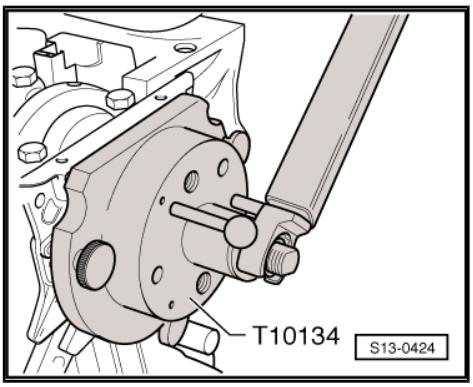


– Tighten the hexagon nut of the assembly tool using a torque wrench with adapter. Tightening torque: 40 Nm
– Again inspect the fitting position of the rotor on the crankshaft ⇒ page 42 .

If the dimension -a- is again too small:

– Tighten the hexagon nut of the assembly device to 45 Nm.
– Again inspect the fitting position of the rotor on the crankshaft ⇒ page 42 .



2.6 Removing and installing drive plate

Special tools and workshop equipment required

- Flywheel lock - MP 1-221 (VW 558)-
- Depth gauge
- Hexagon bolt - M8x45-
- Two hexagon nuts - M10-

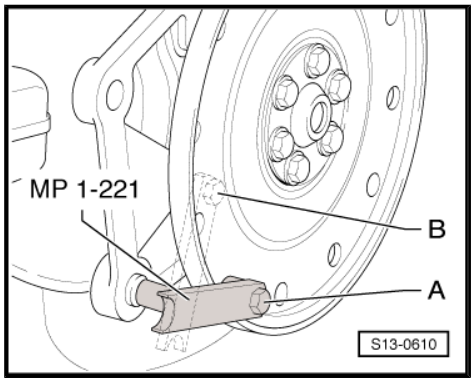
Remove drive plate

– Remove gearbox ⇒ Rep. gr. 37 ; Automatic transmission .

– Attach the counterholder - MP 1-221- to the drive plate with hexagon bolt - M8x45- . Insert two hexagon nuts - M10- between the counterholder and drive plate.

Fitting position of the tool:

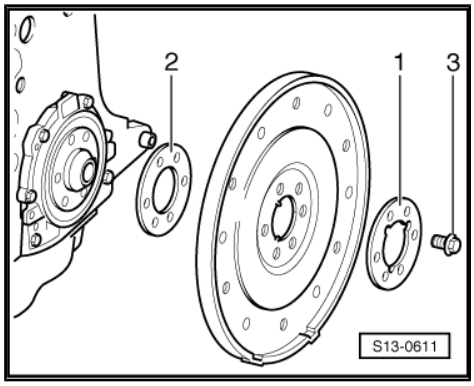
-A- to loosen
-B- to tighten



Installing the drive plate

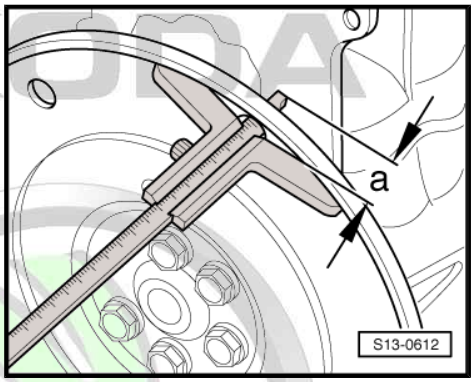
– Insert the drive plate using the washer with recesses -1-.

– Insert new bolts -3- and tighten to 30 Nm.



– Check dimension -a- in three points and determine the mean value.

• Specified value: 19.5 … 21.1 mm



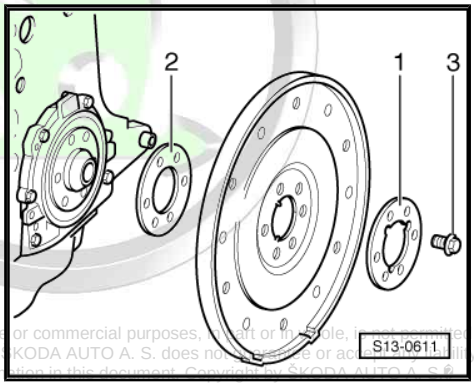
Note

The measurement is made through the hole of the drive plate to the milled surface of the cylinder block.

If the measurement is less than the specification:

– Remove driver disc again and also use compensating washer -2-. Tighten screws -3- to 30 Nm again.

– Tighten screws -3- to 60 Nm and torque a further 90° ($^1/_4$ turn, the tightening may occur in several stages).



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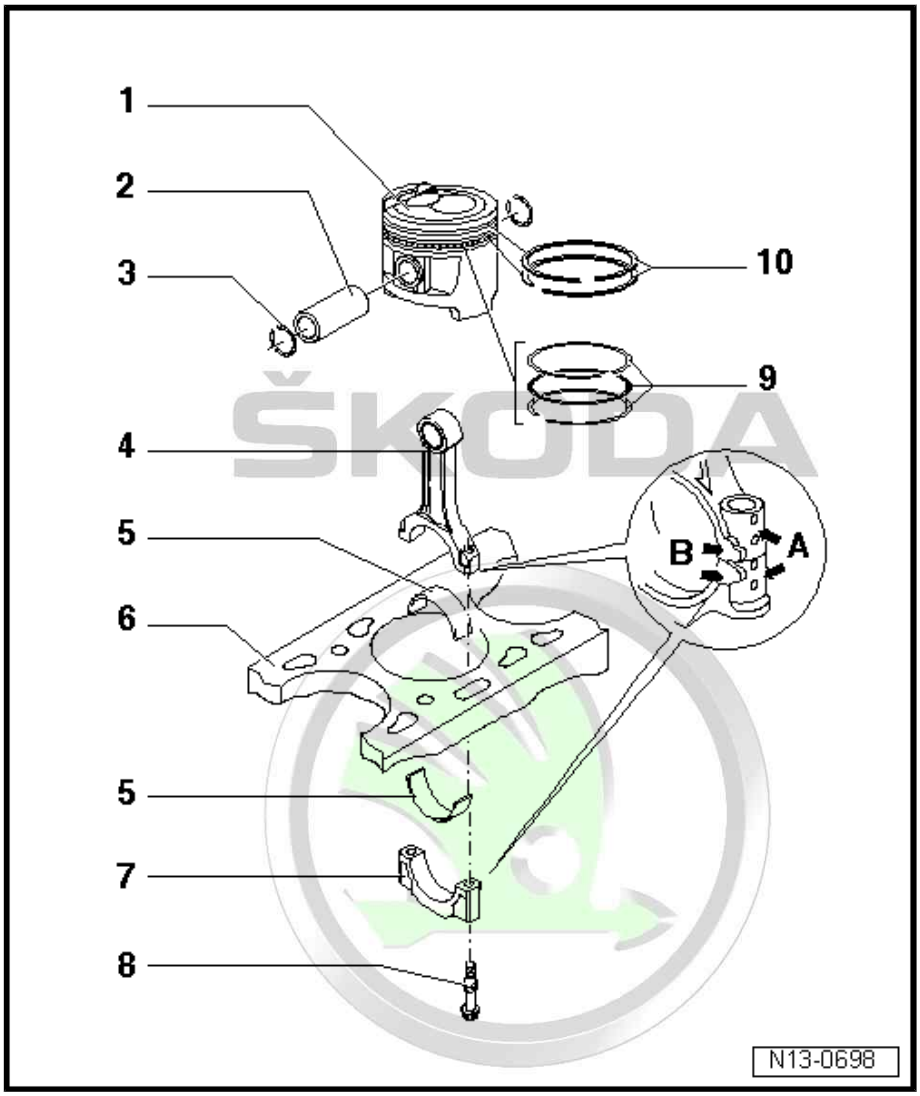
3 Pistons and conrods

3.1 Assembly overview - piston and conrod



1 - Piston

- ❑ check ⇒ page 46
- ❑ mark installation position and matching cylinder
- ❑ arrow on the piston crown faces towards the belt pulley side
- ❑ Piston ∅: 76.455 mm (nominal dimension)

2 - Piston pin

- ❑ if stiff, heat piston to approx. 60°C
- ❑ use drift - T10046- for removing and installing

3 - Circlip

4 - Conrod

- ❑ always replace as a set only
- ❑ Mark with cylinder number -A-.
- ❑ Fitting position: Markings -B- point to belt pulley side
- ❑ Guided axially by piston.
- ❑ separate new conrod ⇒ page 47

5 - Bearing shell

- ❑ do not mix up used bearing shells (mark)
- ❑ Insert bearing shells centrally.

6 - Cylinder block

- ❑ inspect cylinder bore ⇒ page 47
- ❑ Cylinder ∅: 76.51 mm (nominal dimension)

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7 - Conrod bearing cap

- ❑ as a result of the conrods separated in the cracking process, the cover fits only in one position and only to the relevant conrod

8 - Conrod bolt, 30 Nm + torque a further + 90° (1/4 turn)

- ❑ replace
- ❑ Oil thread and contact surface

9 - Oil scraper ring

- ❑ carefully remove and install 3-part oil scraper rings by hand
- ❑ Inspect gap clearance ⇒ page 46
- ❑ Ring-to-groove clearance not measurable.

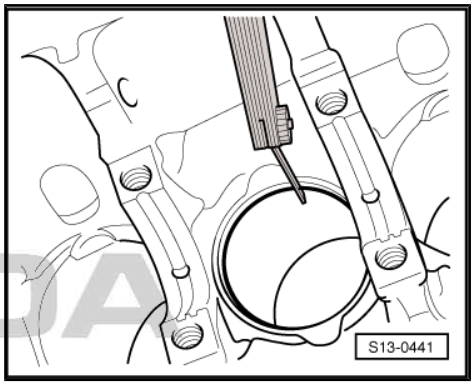
10 - Gasket rings

- ❑ Offset joint 120°
- ❑ use piston ring pliers for removing and installing
- ❑ marking -TOP- must face towards piston crown
- ❑ Inspect gap clearance ⇒ page 46
- ❑ Inspect end clearance ⇒ page 46

Inspecting piston ring gap clearance

– Push in ring at right angles to the cylinder wall from the top through to the bottom cylinder opening, about 15 mm from the lower cylinder edge.

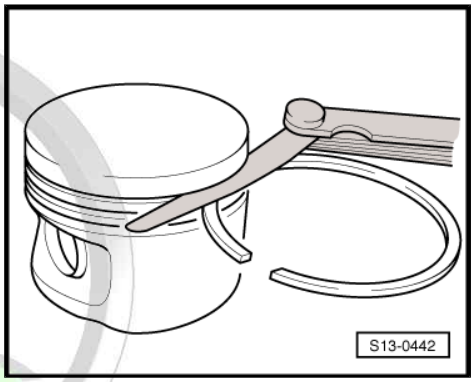
Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,20…0,50	1,0
2. Compression ring	0,40…0,60	1,0
Oil scraper ring	0,20…1,10	no wear indication possible



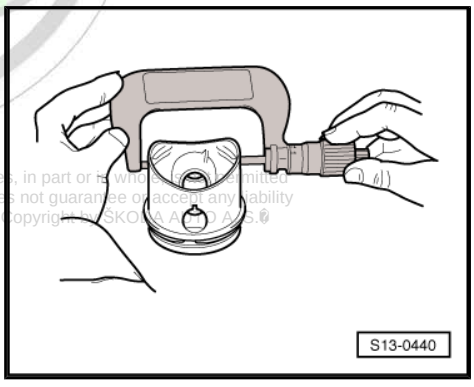
Inspect piston ring end clearance

– Clean the annular groove before beginning the measurement.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,04…0,08	0,15
2. Compression ring	0,02…0,08	0,15
Oil scraper ring	Not measurable	



Inspecting pistons



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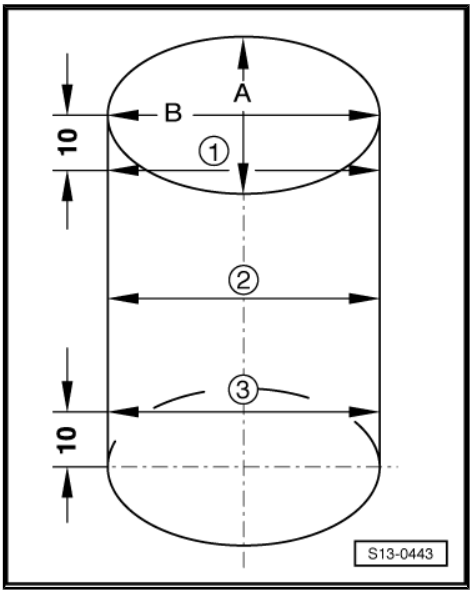
Special tools and workshop equipment required

- ♦ External micrometer 75...100 mm

– Measure about 10 mm from the lower edge, offset at right angles to the piston pin shaft.

- Deviations from specified dimension: max. 0.04 mm

Inspecting cylinder bore



Special tools and workshop equipment required

♦ Internal precision measuring instrument 50...100 mm

– Measure at three points crosswise in a transverse direction -A- and lengthwise -B-.

- Deviations from specified dimension: max. 0.08 mm

Note

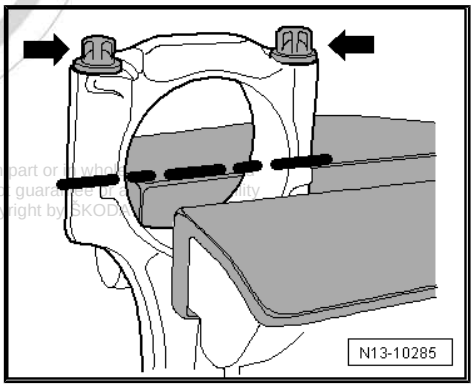
Do not measure the cylinder bore if the cylinder block is fixed to the assembly stand with the engine mount -MP 1-202- , as this may result in incorrect measurements.

3.2 Separating new conrod

It can happen that on new connecting rods, the provided separation point is not completely cracked. If the conrod bearing cap cannot be removed by hand, proceed in the following manner:

– Mark the assignment of the conrod to the cylinder.

– Slightly clamp the connecting rod, as shown in the illustration, in a vice provided with aluminium protective jaws.



Note

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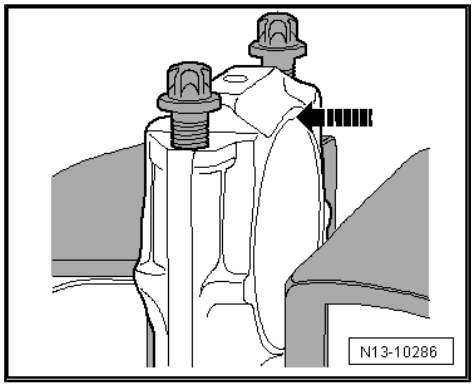
♦ *Only tension the conrod slightly in order to avoid damage on the conrod.*

♦ *The conrod is clamped below the broken line.*

– Unscrew both screws -arrows- by approx. 5 turns.

– Knock against the conrod bearing cap with a plastic hammer in -direction of arrow- in order to loosen it.



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15 – Cylinder head, valve gear

1 Cylinder head

1.1 Summary of components - cylinder head

Testing compression pressure ⇒ page 71 .

Note

- *When installing a replacement cylinder head, all the contact surfaces between hydraulic balancing elements, roller rocker fingers, and the cam tracks must be oiled before installing the camshaft housing.*
- *Do not remove the plastic bases supplied as a protection for the open valves until just before fitting on the cylinder head.*
- *If the cylinder head is replaced, also the entire coolant must be replaced.*
- *Before assembly moisten all bearing points and contact surfaces with oil.*
- *Removing and installing intake manifold ⇒ page 138 .*

1 - Cable guide
- ❑ Screwed onto camshaft housing to 8 Nm

2 - 10 Nm

3 - 10 Nm + torque a further 90° (1/4 turn)
- ❑ replace
- ❑ unscrew from the outside to the inside ⇒ page 64
- ❑ tighten from the inside to the outside ⇒ page 64

4 - 8 Nm

5 - to air filter

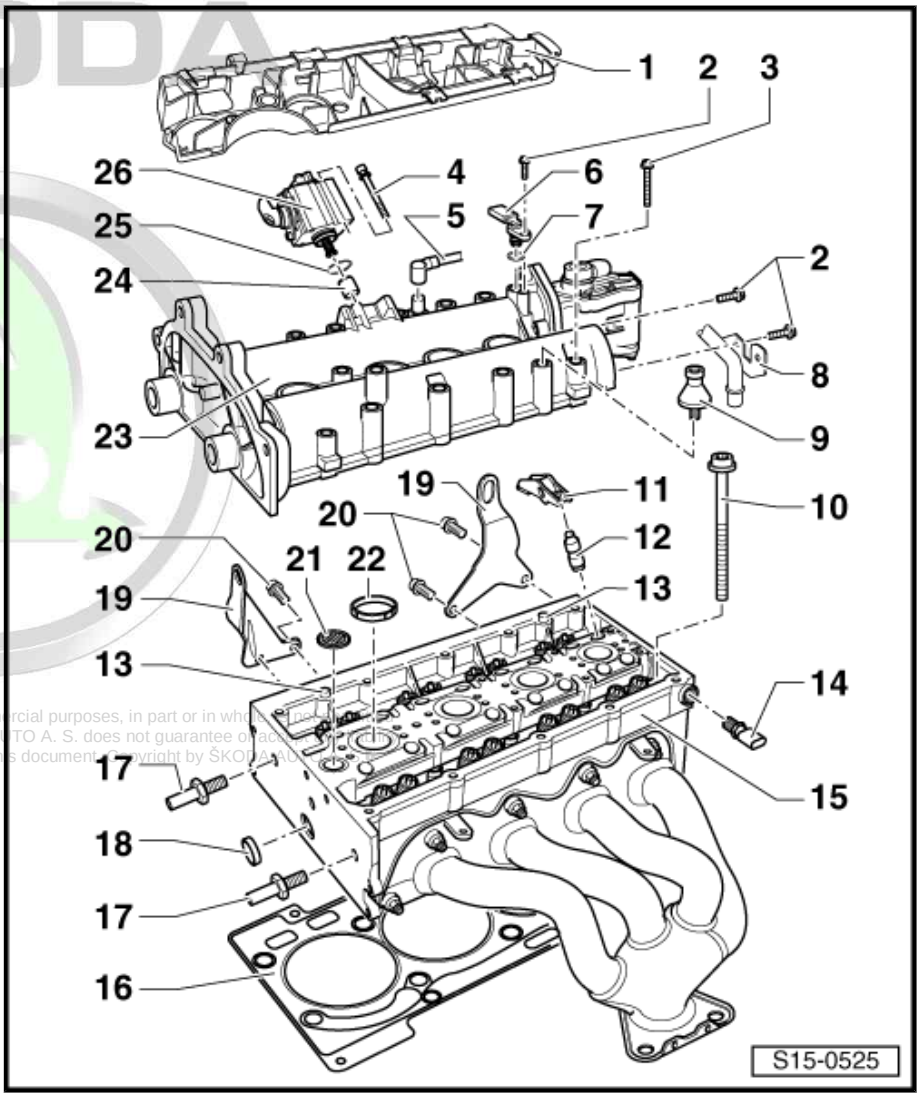
6 - Hall sender - G40-

7 - O-ring
- ❑ replace if damaged

8 - Coolant pipe with holder

9 - Spacer, 6 Nm
- ❑ for engine trim panel with air filter

10 - Cylinder head bolt
- ❑ replace
- ❑ Follow installation instructions and sequence when loosening and tightening ⇒ page 68 .



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11 - Roller rocker arm

- ❑ inspect roller bearings for smooth operation
- ❑ oil contact surface
- ❑ for installing, clip onto the supporting element with the locking clip

12 - Hydraulic supporting element

- ❑ do not interchange
- ❑ with hydraulic valve clearance compensation
- ❑ oil contact surface

13 - Dowel pins

14 - Oil pressure switch - F1- , 25 Nm

- ❑ 0.05 MPa (0.5 bar)
- ❑ check ⇒ page 91
- ❑ Cut open gasket ring if leaking and replace

15 - Cylinder head

- ❑ removing and installing ⇒ page 68
- ❑ check for distortion ⇒ page 51
- ❑ Sealing surfaces to the camshaft housing must be free of oil and grease.
- ❑ after replacing fill entire system with fresh coolant

16 - Cylinder head gasket

- ❑ replace
- ❑ metal gasket

17 - Guide bolt

- ❑ Tightening torque: 20 Nm

18 - Screw cap

- ❑ replace if leaking

Removing:

– Pierce through the centre using an expanding mandrel and pull out as straight as possible using a suitable tool.

Make sure the sealing surface on the cylinder head is not damaged.

Installing:

– Thoroughly clean the sealing surface in the cylinder head

– Thinly coat the new cap sideways all around with sealant ⇒ ETKA - Electronic catalogue of original parts .

– Drive screw cap with drift pin e.g. pressure plate - MP 3-410 (VW 434)- straight into the hole.

• The finishing edge of the screw cap must be approx. 1 mm deep in relation to the end face of the cylinder head.

– Wipe off any sealant oozing out.

19 - Lifting eye

20 - 20 Nm

21 - Oil strainer

- ❑ inserted into the cylinder head
- ❑ replace

22 - Sealing ring

- ❑ replace
- ❑ 4 pieces

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- ❑ inserted into the cylinder head (groove)
- ❑ not installed in all engines; note different seals for the camshaft housing ⇒ page 64

23 - Camshaft housing

- ❑ with integrated camshaft bearings
- ❑ removing and installing ⇒ page 64
- ❑ remove old sealant residues
- ❑ Clean sealing surfaces, they must be free of oil and grease
- ❑ before positioning, apply sealant ⇒ ETKA - Electronic Catalogue of Original Parts
- ❑ When installing, position onto the pin bolts and fitted pins from the top

24 - Bucket tappets

- ❑ oil contact surface

25 - O-ring

- ❑ replace
- ❑ Moisten with oil before installing

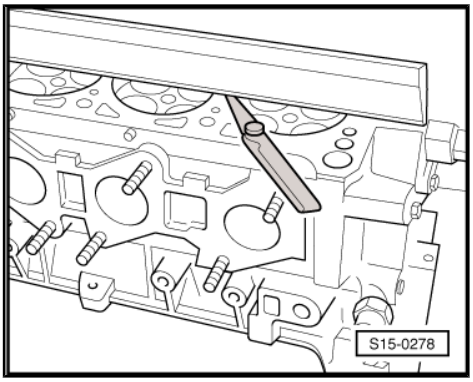
26 - Fuel high pressure pump

- ❑ for fuel supply
- ❑ with fuel pressure regulating valve - N276 -
- ❑ only replace completely with fuel pressure regulating valve - N276- and screw connectors for fuel lines
- ❑ Do not unscrew screw cap!
- ❑ Do not unscrew screw connectors for fuel lines and fuel pressure regulating valve - N276- !
- ❑ removing and installing ⇒ page 150

Inspecting the cylinder head for distortion

Check with straightedge 500 mm , e. g. -VAS 6075 - and feeler gauge.

- Max. permissible distortion: 0.05 mm



1.2 Convert camshaft clamp - T10171- to camshaft clamp - T10171 A- .

Note

The fastening points for securing the camshaft clamp have changed. A new special tool called a camshaft clamp - T10171 A- is used. The former camshaft clamp - T10171- can still be used if the work is carried out as described.

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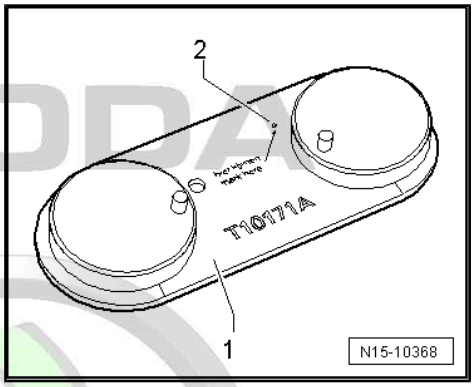
– Place template -1- on the camshaft clamp - T10171- as shown.
– Mark camshaft clamp - T10171 - at marking -2- with a centre punch.
– Drill through the camshaft clamp - T10171 - using a 7 mm drill.
– Deburr bore on both sides.
– Also mark tool designation “T10171” with an “A”.



1.3 Checking valve timing

Special tools and workshop equipment required

- Adapter for dial gauge - T10170-
- Dial gauge, commercially available
- Camshaft clamp - T10171 A-

Convert camshaft clamp - T10171- to camshaft clamp - T10171 A- ⇒ page 51 .

- Dial gauge, commercially available

Test sequence

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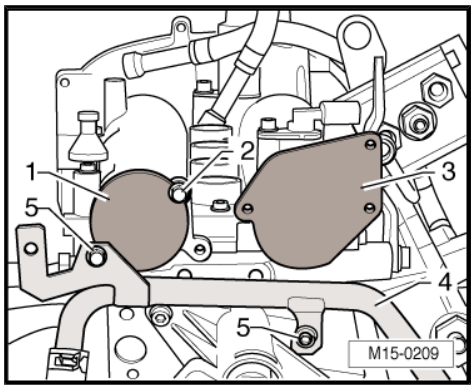
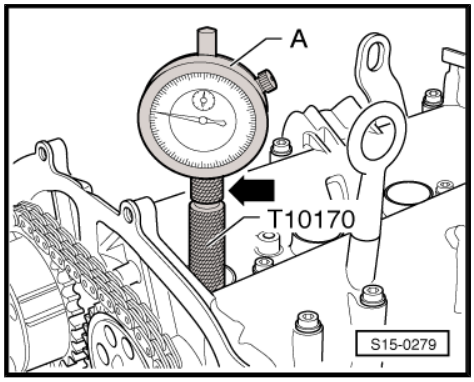
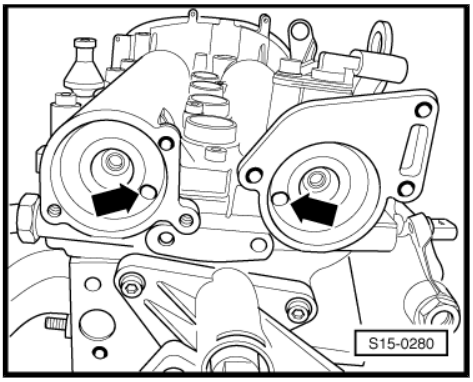
– Remove exhaust gas recirculation valve ⇒ page 166 and screw caps for camshafts.
– Unhook wire harness (not shown in the fig.) from the coolant pipe -4-.
– Unscrew screws -5- from the coolant pipe -4-.
– Unscrew screws -2- from the cover -1-.
– Remove covers -1- and -3-. Collect any engine oil which flows out with a cloth.
– Remove ignition coil for cylinder 1 ⇒ page 168 and unscrew the spark plug.



– Screw adapter for dial gauge - T10170 - up to the stop into the spark plug thread.
– Insert the dial gauge -A- with extension - T10170/1- up to the stop and fix in place using the clamping screw -arrow-.
– Turn the crankshaft in the direction of rotation of the engine to TDC for cylinder 1 and note the position of the small pointer of the dial gauge.



The holes -arrows- in the camshafts must be positioned as shown. If necessary rotate the crankshaft a further revolution (360°).



Note

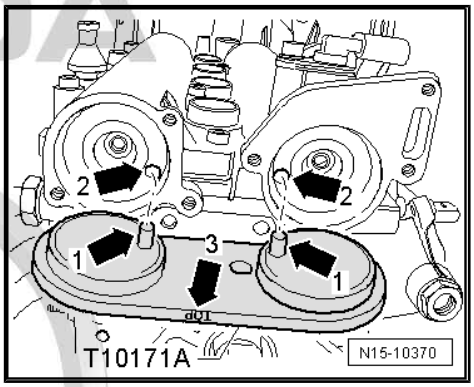
- *If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre for cylinder 1.*
- *Permissible deviation from TDC for cylinder 1: ± 0.01 mm.*

Caution

- ***Before fitting on the camshaft fixer/locator - T10171A- , it is essential to check whether the tensioning sleeves protrude at least 7 mm.***
- ***If this is not the case, then the camshaft fixer/locator is defective and must be replaced.***
- ***The camshaft fixer/locator must not be inserted using force or for example with blows of a hammer.***

– Insert camshaft fixer/locator - T10171 A - up to the stop into the holes in the camshaft housing.

• The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription “TOP” -arrow 3- must be legible from above.



If the camshaft fixer/locator - T10171 A- cannot be inserted up to the stop in the camshaft openings, the timing is not correct and must be set ⇒ page 53 .

The timing is O.K., if the camshaft fixer/locator - T10171 A- can be inserted up to the stop into the camshaft openings.

The further installation is carried out in reverse order to removal. Pay attention to the following:

- Replace the gasket rings for the caps of the camshafts and oil before assembly.
- Installing exhaust gas recirculation valve ⇒ page 166 .

1.4 Adjusting valve timing

Special tools and workshop equipment required

- Adapter for dial gauge - T10170-
- Camshaft clamp - T10171 A-

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Convert camshaft clamp - T10171- to camshaft clamp - T10171 A- ⇒ page 51 .

- Counterholder - T10172-
- Counterholder - T30004 (3415)-
- Rig pin - T40011-
- Dial gauge, commercially available

Work procedure

- Timing check not carried out

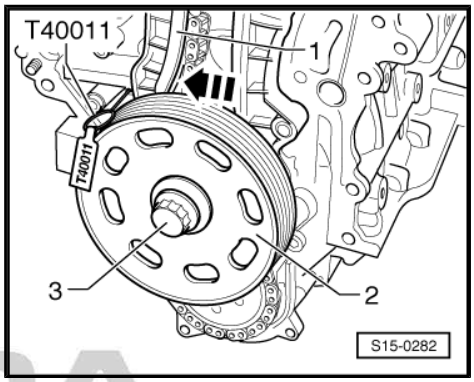
– Remove exhaust gas recirculation valve ⇒ page 166 and screw caps for camshafts.

- Timing check carried out

– Remove timing case ⇒ page 26 .

– To turn the crankshaft, insert the distance sleeve, the vibration damper -2- and the fixing screw -3- and tighten the fixing screw (use counterholder - T30004-).

– Remove ignition coil for cylinder 1 ⇒ page 168 and unscrew the spark plug.

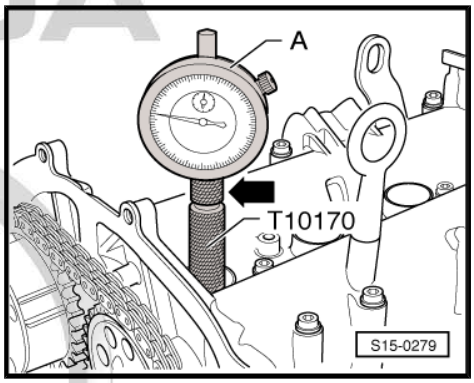


– Screw adapter for dial gauge - T10170 - up to the stop into the spark plug thread.

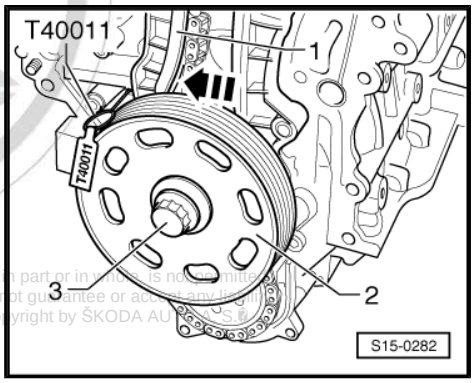
– Insert the dial gauge -A- with extension - T10170/1- up to the stop and fix in place using the clamping screw -arrow-.

– Turn the crankshaft in the direction of rotation of the engine to TDC for cylinder 1 and note the position of the small pointer of the dial gauge.

– Then rotate the crankshaft 45° (1/4 turn) in the opposite direction of rotation of the engine.



– Press the tensioning rail -1- in -direction of arrow- and interlock the piston with the rig pin - T40011- .



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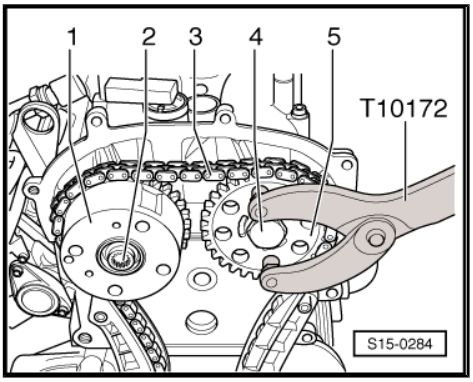
– Mark with a suitable felt-tip pen the direction of rotation of the timing chain -3-.



Note

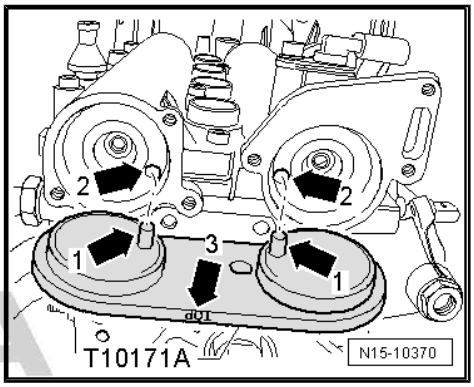
The fixing screw of the camshaft adjuster -2- has a left-hand thread.

– Release screws -2- and -4- and remove the camshaft adjuster -1- with the timing chain -3-. Use counterholder - T10172- for this purpose.

– Mount again camshaft adjuster -1-.

– Replace screws -2- and -4- and tighten screw -2- to 40 Nm and screw -4- to 50 Nm; (use counterholder - T10172- to do so).

– Turn the inlet and exhaust camshaft until the camshaft fixer/locator - T10171 A- can be inserted up to the stop into the camshaft openings.



Caution

- *Before fitting on the camshaft fixer/locator - T10171A- , it is essential to check whether the tensioning sleeves protrude at least 7 mm.*
- *If this is not the case, then the camshaft fixer/locator is defective and must be replaced.*
- *The camshaft fixer/locator must not be inserted using force or for example with blows of a hammer.*

• The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription “TOP” -arrow 3- must be legible from above.

Note

When turning, the camshafts must not be moved axially.

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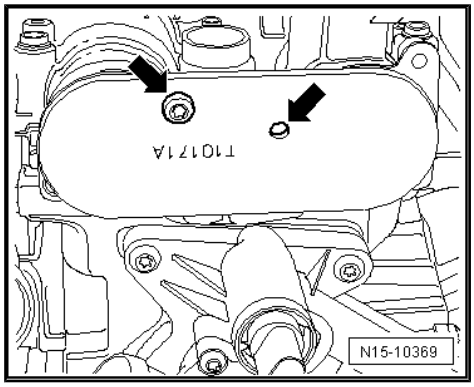
– To secure the camshaft fixer/locator - T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.



Note

Pay attention that there are different fixing points for the camshaft fixer/locator - T10171 A- .

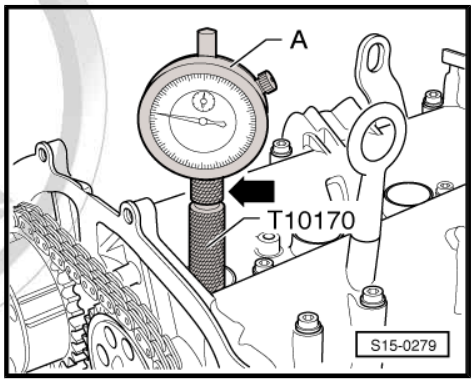
– Slacken the screws of the camshaft chain sprockets.

Absolutely use counterholder - T10172 - .

Caution

Do not use the camshaft fixer/locator - T10171 A- as a counterholder.

– Removing the camshaft chain sprocket.
– Place the timing chain onto the camshaft chain sprockets in compliance with the running direction and reinsert the removed camshaft chain sprocket.
– Screw in the camshaft screws so far so that the camshaft chain sprockets can still be turned on the camshaft.
– Tighten the timing chain, by pulling out the rig pin - T40011- .
– Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1.



• Permissible deviation from TDC for cylinder 1: ± 0.01 mm.

Note

If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre for cylinder 1.

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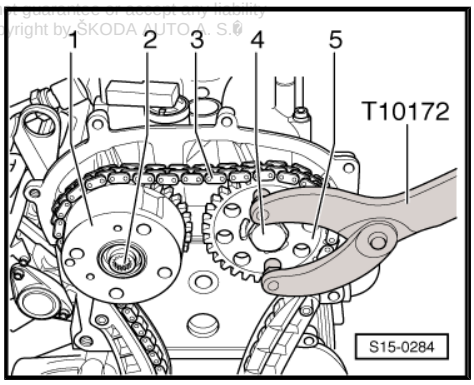
– Hold the camshaft chain sprockets -1- and -5- in this position with the counterholder - T10172- and tighten the screw -2- (left-hand thread) to 40 Nm and the screw -4- to 50 Nm.



Note

When tightening the camshaft screws, the crankshaft must not turn and the timing chain -3- must remain tightened on both sides.

– Remove the camshaft fixer/locator - T10171 A - .
– Turn the crankshaft in direction of rotation of engine by 2 turns on TDC for cylinder 1.

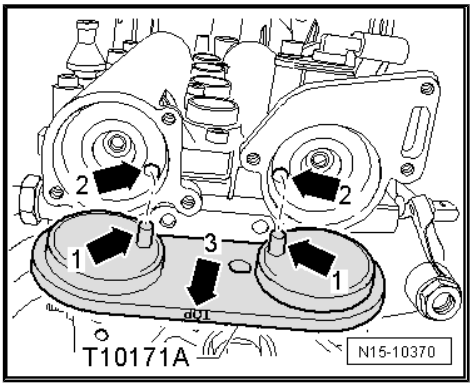
• Permissible deviation from TDC for cylinder 1: ± 0.01 mm.

– Insert camshaft fixer/locator - T10171 A - up to the stop into the holes in the camshaft housing.

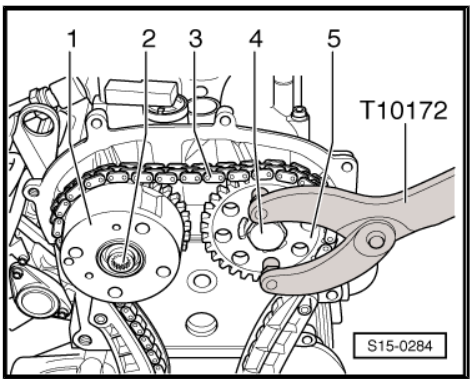
If the camshaft fixer/locator - T10171 A- is not insertable.

– Repeat setting.

If the camshaft fixer/locator - T10171 A- is insertable.



– Remove camshaft clamp - T10171 A - , hold camshaft sprockets using the counterholder - T10172- and screw in screws -2- (left-hand thread) and -4- a further 90° using a rigid wrench ($^1/_4$ turn).



Note

- *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*
- *The camshaft chain sprockets must not be turned on the camshaft when tightening.*

– Turn the crankshaft again in direction of rotation of engine by 2 turns on TDC for cylinder 1.

• Permissible deviation from TDC for cylinder 1: ± 0.01 mm.

– Insert camshaft fixer/locator - T10171 A - up to the stop into the holes in the camshaft housing.

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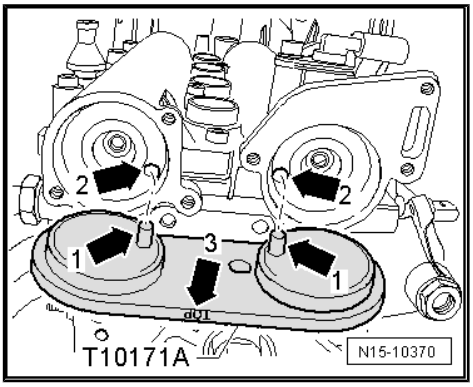
If the camshaft fixer/locator - T10171 A- is not insertable.

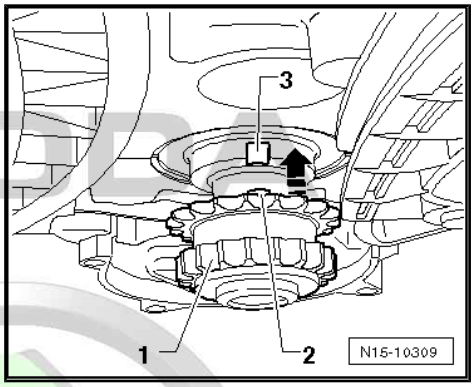
– Repeat setting.

The further installation is carried out in reverse order to removal. Pay attention to the following:



Note

- *Risk of engine damage.*
- *In order to avoid that the chain sprocket on the crankshaft slides out of the driver, the crankshaft must not be turned when the V-ribbed belt pulley is released.*
- *The integrated peg -2- of the chain sprocket -1- must fit into the slot -3- at the crankshaft stub.*



- Before installing, loosen the fixing screws, remove vibration damper and distance sleeve.
- Install timing case ⇒ page 26 .
- Replace the gasket rings for the caps of the camshafts and oil before assembly.
- Installing exhaust gas recirculation valve ⇒ page 166 .

1.5 Removing and installing timing chain and drive chain for oil pump

Special tools and workshop equipment required

- Counterholder - T30004 (3415)-
- Extractor - T10094A-
- Adapter for dial gauge - T10170-
- Camshaft clamp - T10171 A-

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Convert camshaft clamp - T10171- to camshaft clamp - T10171 A- ⇒ page 51 .

- Counterholder - T10172-
- Rig pin - T40011-
- Dial gauge , commercially available

Removing

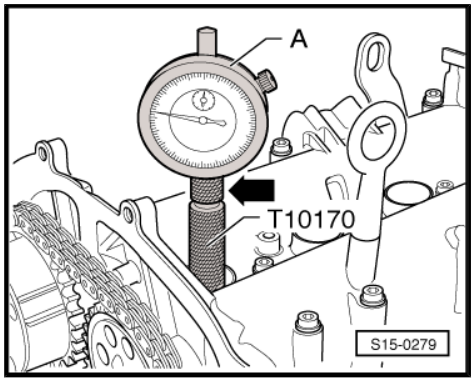
– Remove exhaust gas recirculation valve ⇒ page 166 and screw caps for camshafts.

– Remove ignition coil for cylinder 1 ⇒ page 168 and unscrew the spark plug.

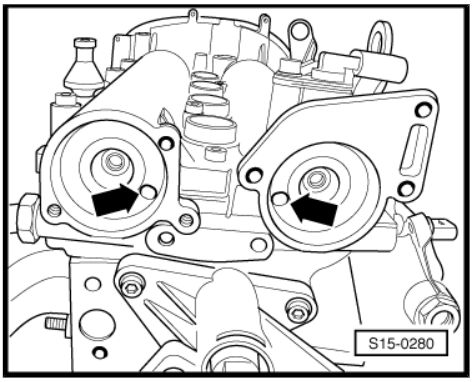
– Screw adapter for dial gauge - T10170 - up to the stop into the spark plug thread.

– Insert the dial gauge -A- with extension - T10170/1- up to the stop and fix in place using the clamping screw -arrow-.

– Turn the crankshaft in the direction of rotation of the engine to TDC for cylinder 1 and note the position of the small pointer of the dial gauge.



The holes -arrows- in the camshafts must be positioned as shown. If necessary rotate the crankshaft a further revolution (360°).

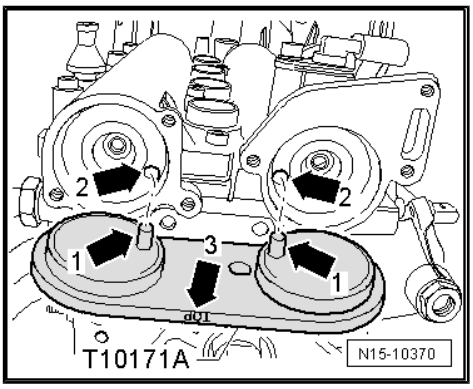


Note

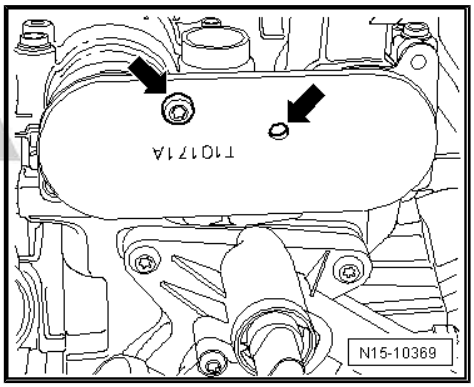
- *If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre for cylinder 1.*
- *Permissible deviation from TDC for cylinder 1: ± 0.01 mm.*

– Insert camshaft fixer/locator - T10171 A - up to the stop into the holes in the camshaft housing.

• The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription “TOP” -arrow 3- must be legible from above.



– To secure the camshaft fixer/locator - T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.

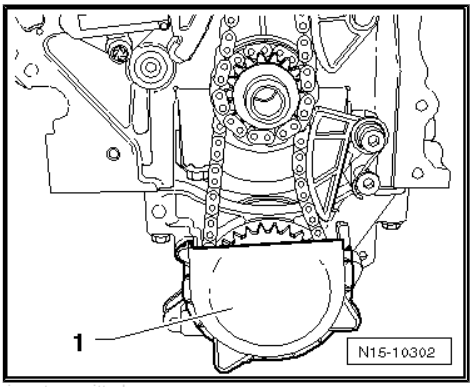


Note

Pay attention that there are different fixing points for the camshaft fixer/locator - T10171 A- .

– Remove timing case ⇒ page 26 .

– Pull off cover -1- from chain sprocket of oil pump.



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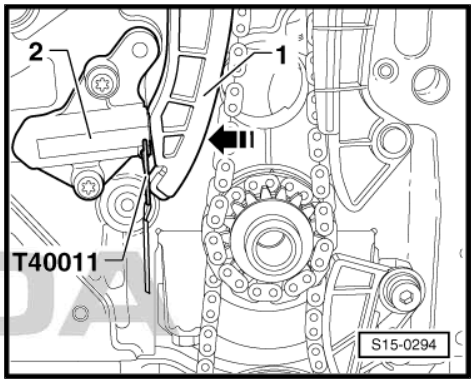
– Press the tensioning rail -1- by hand in -direction of arrow- and interlock the piston of the chain tensioner -2- with the rig pin - T40011- .
– Remove chain tensioner -2-.

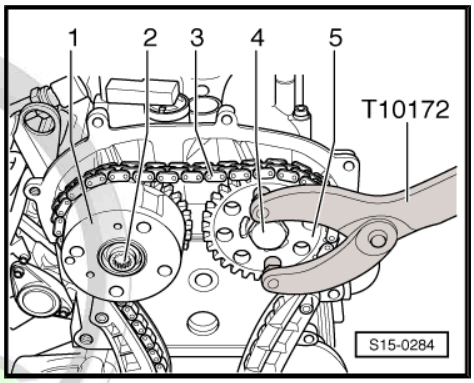


– Mark with a suitable felt-tip pen the direction of rotation of the timing chain -3-.

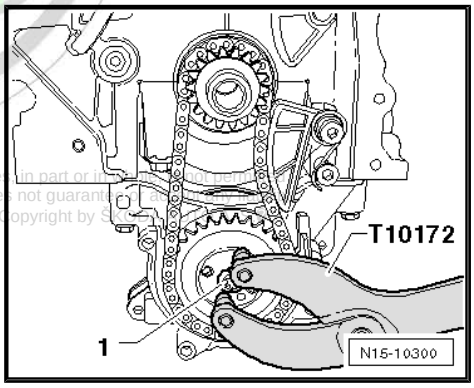
Note

The fixing screw of the camshaft adjuster -2- has a left-hand thread.

– Release screws -2- and -4- and remove the camshaft adjuster -1- with the timing chain -3-. Use counterholder - T10172- for this purpose.



– Hold the chain sprocket of the oil pump with the counterholder - T10172- and slacken the fixing screw -1-.



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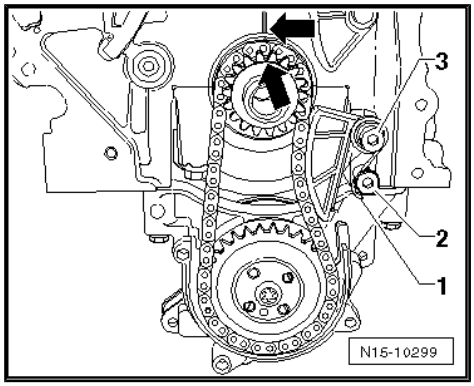
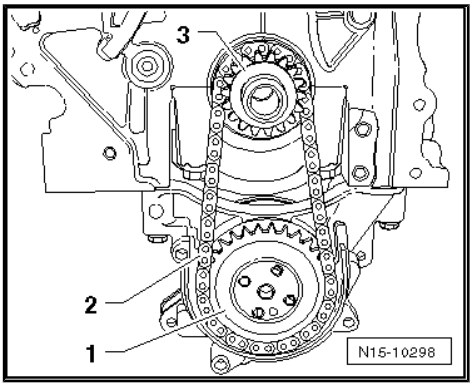
– Lever out tensioning spring -1- at the screw -2- with a screwdriver and remove tensioning spring -1-.
– Unscrew fixing screw -3- and remove the chain tensioner.



– Mark with a suitable felt-tip pen the direction of rotation of the drive chain for oil pump -2-.
– Release the fixing screw of the chain sprocket -1- and remove the chain sprockets -1- and -3- together with the drive chain of the oil pump -2-.



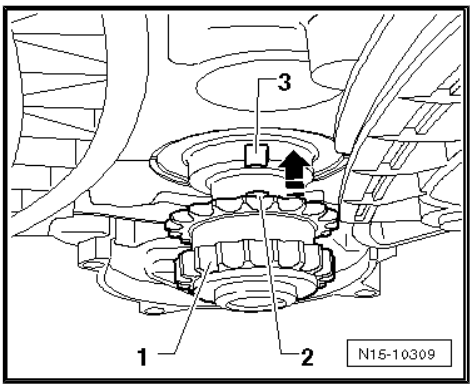
Install

- The crankshaft must be positioned on TDC for cylinder 1.

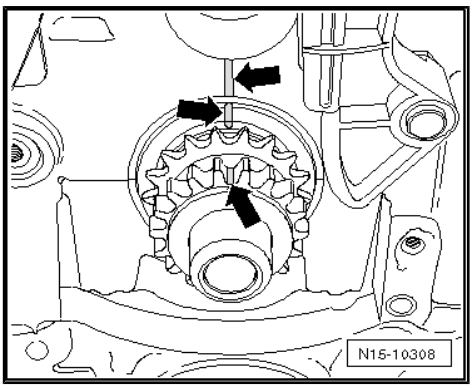
– Push chain sprocket -1- in -direction of arrow- up to the stop onto the crankshaft journal.

Caution

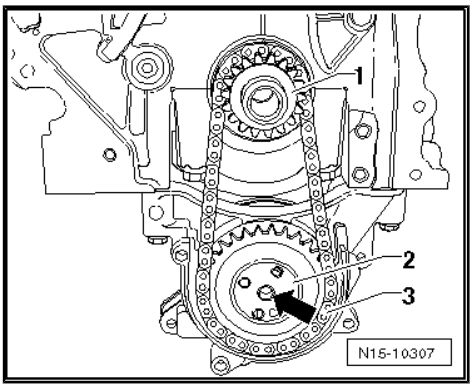
The integrated peg -2- of the chain sprocket -1- must fit into the slot -3- at the crankshaft stub.



– Mark the positions of the chain sprocket and the crankshaft to the cylinder block with a felt-tip pen.



– Fit the drive chain for oil pump -3- onto the chain sprocket -1-.
– Place the chain sprocket of the oil pump -2- into the drive chain for oil pump -3- and mount it onto the drive shaft of the oil pump.



Note

- *Observe the marking of the running direction on the drive chain for oil pump.*
- *The chain sprocket of the oil pump only adapts to one position on the drive shaft of the oil pump -arrow-.*

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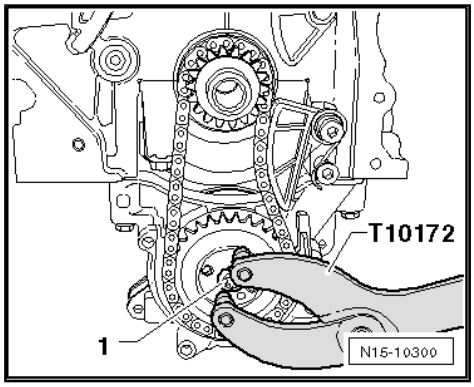
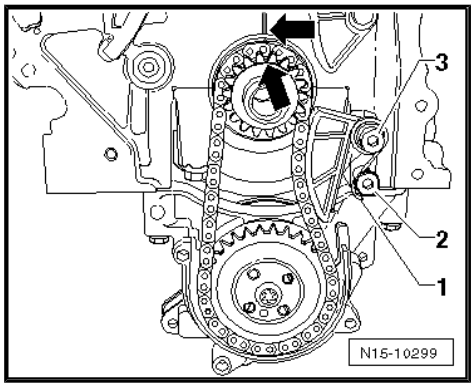
– Hold the chain sprocket of the oil pump with the counterholder - T10172- .

– Tighten fixing screw -1- to 20 Nm and torque a further $^1/_4$ turn (90°).



– Position the chain sprocket onto the drive chain for the oil pump and tighten the fixing screw -3- to 15 Nm.

– Lever the tensioning spring -1- onto the screw -2- with a screwdriver.

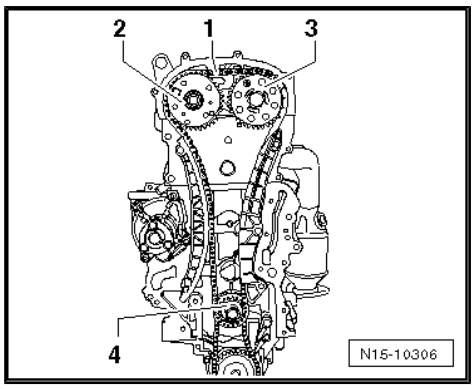


Note

- *Observe markings -arrows-.*
- *The crankshaft should not turn.*

– Screw on the chain sprocket -3- by hand with a new fixing screw.

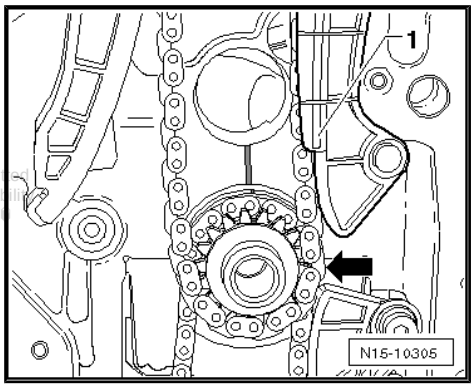
– Place the timing chain -1- onto the chain sprocket of the crankshaft -4-, the chain sprocket of the outlet camshaft -3- and screw on the camshaft adjuster -2- with a new fixing screw.



Note

- *Observe the marking of the running direction on the timing chain -1-.*
- *Observe that the guide sleeve is installed between the inlet camshaft and camshaft adjuster.*
- *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*

The timing chain must rest on the sliding rail -1- and on the chain sprocket crankshaft -arrow-.



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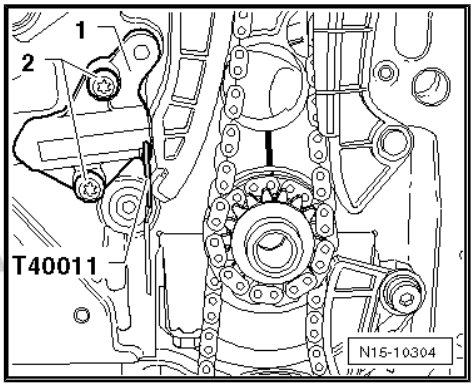
– Install the chain tensioner -1- and tighten the fixing screws -2- to 9 Nm.

– Tighten the timing chain, by pulling out the rig pin - T40011- from the chain tensioner.

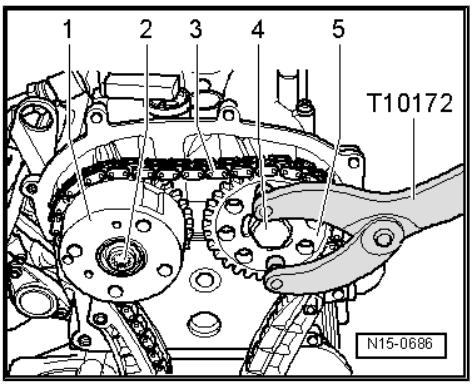
– Check markings on the chain sprocket crankshaft and on the cylinder block; they must be positioned opposite to each other.



– Tighten the fixing screw -2- to 40 Nm and the screw 4-4- to 50 Nm (use counterholder -T10172-).

Note

- *First the fixing screws -2- and -4- are tightened to the torquing angle (90°), after which the timing is checked.*
- *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*



– Screw out screw -arrow- and remove the camshaft fixer/locator - T10171 A- from the camshaft housing.

– Test timing ⇒ page 52 .

If timing is o.k.:

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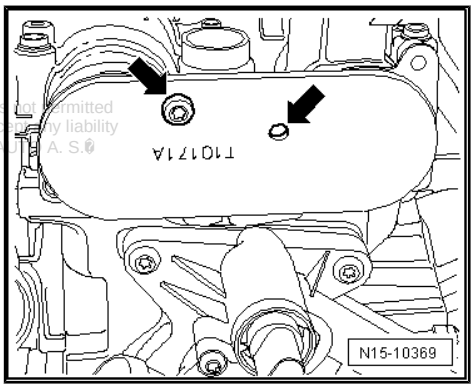
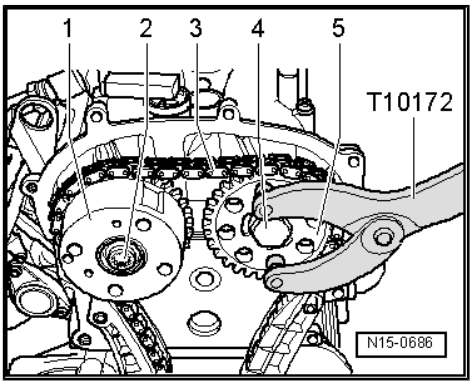


– Hold camshaft chain sprockets in place using the counterholder -T10172- screw in securing bolts -2- (left-hand thread) and -4- using a rigid wrench $^{1}/_{4}$ turn (90°).

Note

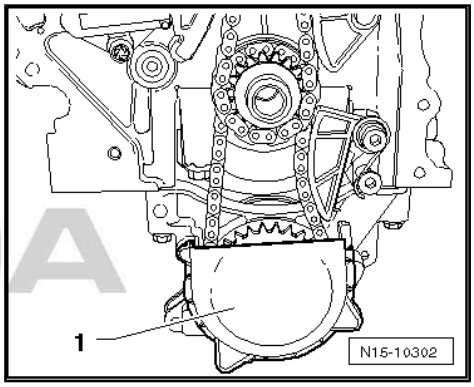
- *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*
- *The camshaft chain sprockets must not be turned on the camshaft when tightening.*



– Install cover for oil pump -1-.

– Install timing case ⇒ page 26 .

The further installation is carried out in reverse order to removal.



1.6 Removing and installing camshaft housing

Special tools and workshop equipment required

♦ Camshaft clamp - T10171 A-

Convert camshaft clamp - T10171- to camshaft clamp - T10171 A- ⇒ page 51 .

♦ two pin bolts (M6x80)

♦ Sealant ⇒ ETKA - Electronic Catalogue of Original Parts

♦ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.

♦ Cleaning and degreasing agent , e.g. -D 009 401 04-

Removing

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Note

♦ *On this engine the camshafts are located in the camshaft housing. Before removing the camshaft housing, the timing case must be removed .*

♦ *Do not rework the sealing surface of the camshaft housing.*

♦ *Summary of components - camshafts ⇒ page 73 .*

Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .

WARNING

Relieve pressure in the high pressure system ⇒ page 3 .

– Remove timing case ⇒ page 26 .

– Turn the crankshaft on TDC for cylinder 1, then turn back the crankshaft approx. 45° in the opposite direction of rotation of the engine and remove the camshaft chain sprockets with the timing chain ⇒ page 53 .

– Remove exhaust gas recirculation valve ⇒ page 166 and screw caps for camshafts.

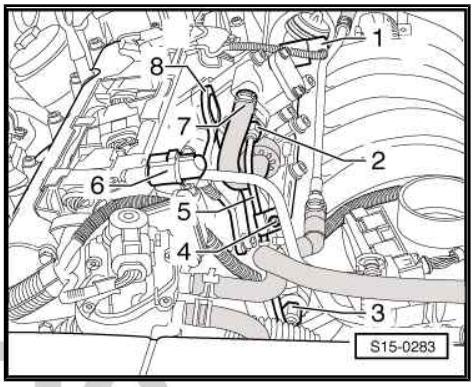
– Remove connector Fuel pressure sender for low-pressure - G410- (if available) and remove from the valve 1 for camshaft adjustment - N205- .

– Unscrew earth lead from camshaft housing.
– Removing ignition coils ⇒ page 168 .
– Remove cable guide with wiring loom from camshaft housing.

Note

Collect the fuel which flows out with a cloth.

– Detach the feed hose -7- from the fuel high pressure pump.



Note

Hold the screwed connections at the high pressure pump and at the fuel distributor when loosening the union nuts with a wrench.

– Remove high-pressure line -5-. Unscrew union nuts -2- and -3- and screw -4-.
– Unplug connector -6-.
– Unscrew left lifting eye -8-.
– Pull out oil dipstick.

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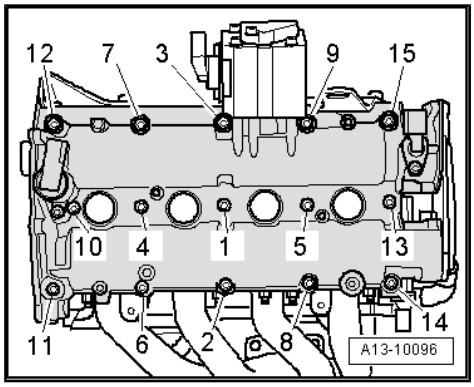
– Remove the screws for camshaft housing in the sequence -15 to 1- .



Note

The screw -Position 9- (beneath the high pressure pump) remains in the camshaft housing.

– Carefully remove the camshaft housing.

Install

Condition

- The pistons must not be in the top dead centre.

WARNING

Wear protective gloves and goggles when working with gasket remover and degreasing agent!

– Remove residual sealant on the cylinder head and camshaft housing using a chemical sealant remover.

– Degrease the sealing surfaces.

– Ensure that no dirt and sealant residues get into the cylinder head.

– Carefully clean the sealing surfaces. They must be free of oil and grease.

Caution

- ***Before fitting on the camshaft fixer/locator - T10171A- , it is essential to check whether the tensioning sleeves protrude at least 7 mm.***
- ***If this is not the case, then the camshaft fixer/locator is defective and must be replaced.***
- ***The camshaft fixer/locator must not be inserted using force or for example with blows of a hammer.***

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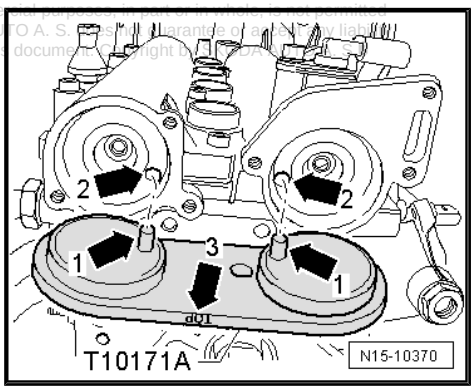
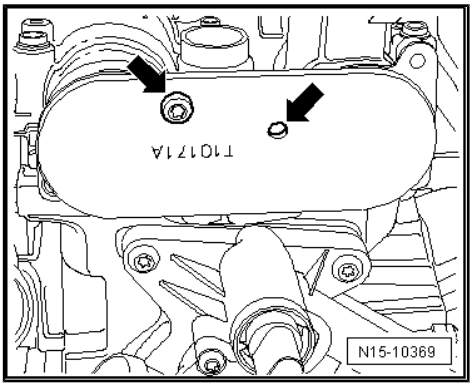
– Turn the inlet and exhaust camshaft until the camshaft fixer/locator - T10171 A- can be inserted up to the stop into the camshaft openings.



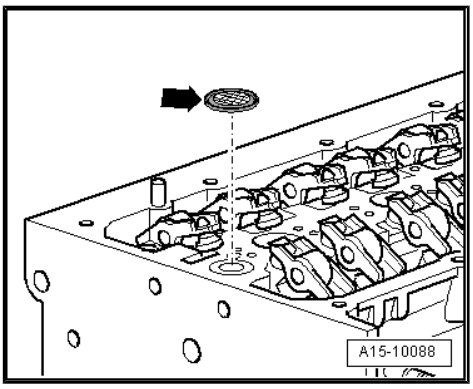
– To secure the camshaft fixer/locator - T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.



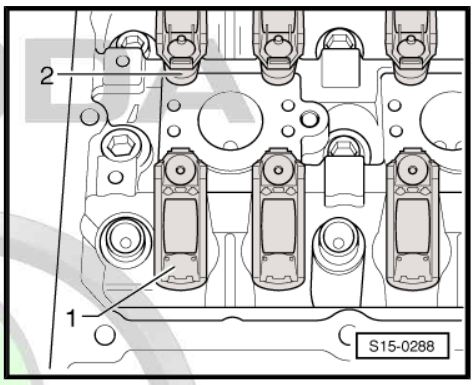
Note

Pay attention that there are different fixing points for the camshaft fixer/locator - T10171 A- .

– Replace oil strainer -arrow- and insert in the cylinder head.

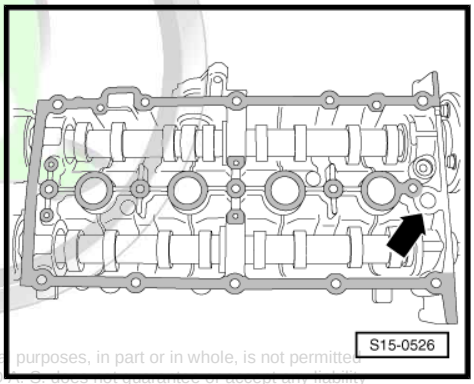


– Ensure that all the roller arms are correctly positioned on the valve stem ends -1- and are clipped in place on the relevant hydraulic supporting elements -2-.



Seal for cylinder head without gasket ring in the area of the spark plug shaft

– Apply a thin coating of sealant ⇒ ETKA Electronic Catalogue of Original Parts uniformly on the clean sealing surface of the camshaft housing (see grid surfaces in the illustration).



Note

- *No sealant must be applied in the area -arrow-. Here the oil strainer seals.*
- *The sealant must not be applied too thickly, as otherwise excess sealant may penetrate into the oil bores and possibly cause engine damage.*

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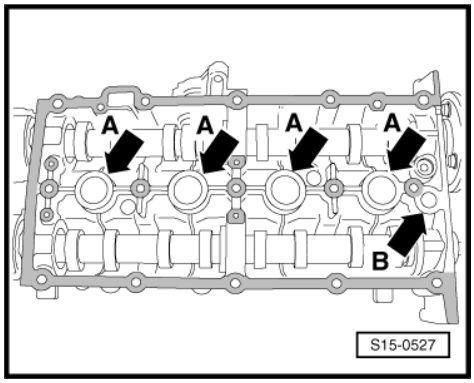
Seal for cylinder head with gasket ring in the area of the spark plug shaft

– Insert 4 new gasket rings into the grooves of the cylinder head.

– Apply a thin coating of sealant ⇒ ETKA Electronic Catalogue of Original Parts uniformly on the clean sealing surface of the camshaft housing (see grid surfaces in the illustration).

– Do not apply sealant in the area of the -arrows A-. Here the cylinder head is sealed with the inserted gasket rings.



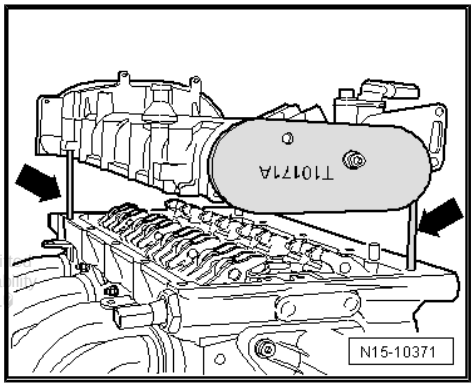
Note

- *No sealant must be applied in the area -arrow B-. Here the oil strainer seals.*
- *The sealant must not be applied too thickly, as otherwise excess sealant may penetrate into the oil bores and possibly cause engine damage.*

Proceed as follows for both cylinder head versions

– Screw in two pin screws (M6 x 80) into the cylinder head before fitting on the camshaft housing.

– Carefully place the camshaft housing vertically from above onto the pin screws -arrows- and dowel pins of the cylinder head.



Note

Make sure that no residues of oil drop down onto the sealing flange and the camshaft housing does not tilt.

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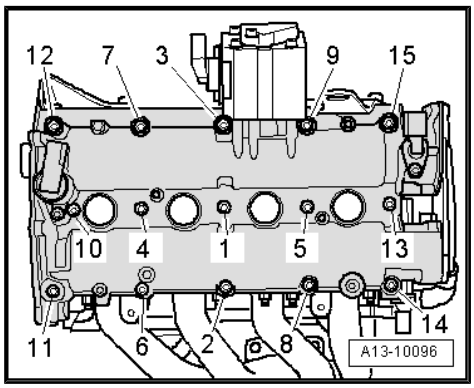
– Tighten the new screws for the camshaft housing in 2 stages in the indicated tightening sequence as follows:



1. Tighten with the torque wrench to 10 Nm.

2. Using a rigid wrench torque a further 90° ($^1/_4$ turn).

Note

After installing the camshaft housing, allow the sealant to dry for about 30 minutes.

– Adjusting valve timing ⇒ page 53 .

Further installation occurs in a similar way in reverse order to removal. Pay attention to the following:

- Install timing case ⇒ page 26 .
- Connect fuel lines ⇒ page 150 .

1.7 Removing and installing the cylinder head

Special tools and workshop equipment required

- Supporting device - T30099-
- Base - T30099/1-
- Hook - MP9-200/10 (10-222A/10) -

- Support - T10358-
- Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.

Removing

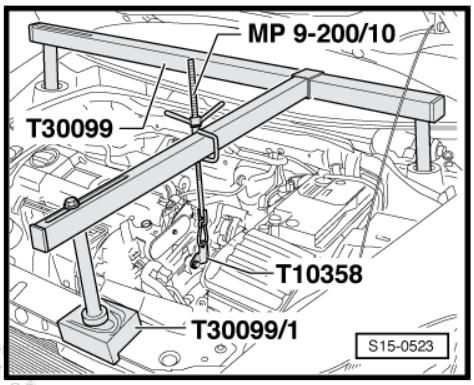
Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .

WARNING

Relieve pressure in the high pressure system ⇒ page 3 .

– Drain coolant ⇒ page 98 .
– Removing the intake manifold ⇒ page 138 .
– Disconnect the front part of the exhaust system with pre-catalytic converter from the exhaust manifold ⇒ page 161 .
– Remove coolant regulator housing from cylinder head.
– Attach the hook - MP9-200/10 - to the support bracket - T30099- , as shown in the figure.
– Position supporting device - T30099- with base - T30099/1- .



Note

The figure points towards the 1.4 litre engine.

– Unscrew the holding down bolt for the gearbox and screw on mounting bracket - T10358- , as shown.
– Suspend hook of spindle from the mounting bracket - T10358- .
– Pre-tension the engine.
– Remove the camshaft housing ⇒ page 64 .
– Remove the timing chain from the camshaft chain sprockets ⇒ page 58 .

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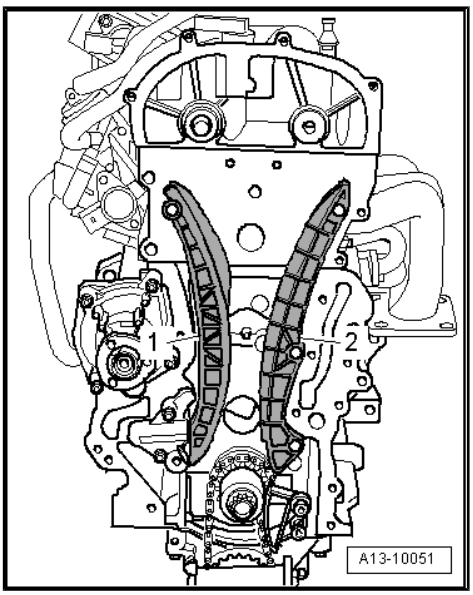
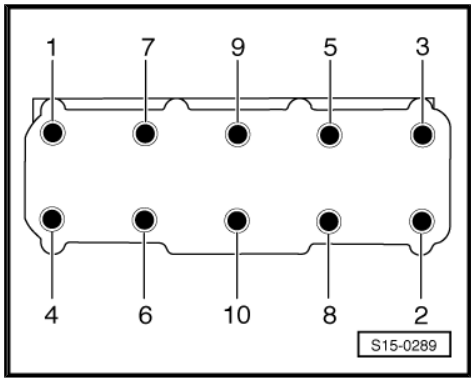
– Remove the tensioning rail -1- and the sliding rail -2- from the bearing bolts.
– Remove the roller rocker arms together with the supporting elements and lay aside on a clean surface.
– Ensure that the roller rocker arms and the supporting elements are not mixed up.



– Release the cylinder head bolts in the specified sequence and remove.

– Carefully remove the cylinder head.



Install

Condition

- The pistons must not be in the top dead centre.

Note

- *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- *Treat the new seal with the utmost care. Damage will cause leakage.*
- *There must be no oil or coolant in the blind holes of the cylinder head bolts in the cylinder block.*

– Stuff clean cloth into the cylinders to avoid any dirt getting in between cylinder wall and piston.

WARNING

Wear protective gloves when working with sealant and grease remover!

– Make sure that when cleaning the cylinder head and cylinder block no foreign particles can get into the cylinder or into the oil and coolant galleries.

– Carefully remove old sealant residue from the cylinder head and cylinder block using a chemical sealant remover.

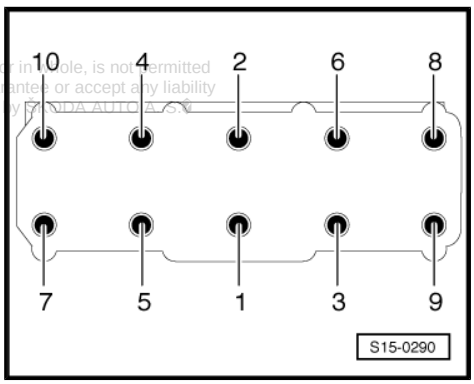
– Position piston of cylinder 1 to top dead centre and slightly turn the crankshaft anticlockwise again.

– Position the new cylinder heads. Text (part number) must be visible.

– Insert the cylinder head. Pay attention to the dowel pins in the cylinder block.

– Insert new cylinder head bolts and tighten by hand.

– Tighten cylinder head bolts in the tightening order shown as follows:



- Tighten all bolts initially to 30 Nm.
- Then, torque all bolts further to 90° ($^1/_4$ turn) with a rigid wrench.
- Finally, once again turn all bolts through a further 90° ($^1/_4$ turn).

– Insert the supporting elements in the cylinder head and position the relevant roller rocker arms on the valve stem ends and the supporting elements.

– Install camshaft housing ⇒ page 64 .

Further installation occurs in a similar way in reverse order to removal.

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1.8 Testing the compression

Special tools and workshop equipment required

- Compression tester , e.g. -V.A.G 1763-

Test condition

Engine oil temperature at least 30 °C.

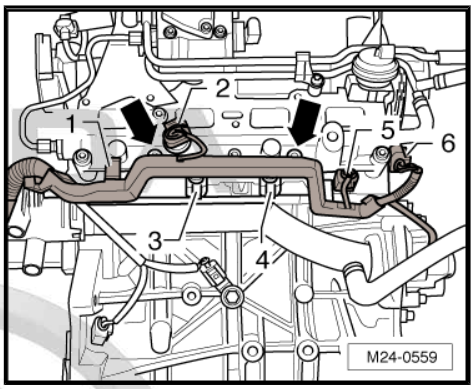
Test sequence

– Remove engine trim panel with air filter ⇒ page 145 .

– Remove the ignition coils and spark plugs ⇒ page 168 .

– Remove connector -1, 3, 4, 5- on the injection valves.

– Check compression pressure using the compression tester.



Note

Use of tester ⇒ Operating Instructions .

– Have a second mechanic operate the starter with the throttle valve fully opened until no further pressure rise is indicated by the tester.

Compression readings

Engine new	Wear limit	Difference between cylinders
1…1.5 MPa (10…15 bar)	0.7 MPa (7 bar)	0.3 MPa (3 bar)

If the specified values are not reached, test the combustion chamber for tightness ⇒ page 71 .

– Screw in the spark plug with spark plug wrench and then tighten fully to 25 Nm.

Further installation occurs in reverse order.

– Query fault memories, rectify any faults and erase fault memories ⇒ Vehicle diagnostic tester.

After deleting the event memory of the engine control unit the readiness code must be re-generated.

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1.9 Testing the combustion chamber for tightness

Special tools and workshop equipment required

- Pressure hose - MP1-210 (VW 653/3)- (replace gasket ring with a spark plug gasket ring)
- Spark plug wrench

Test sequence

– Unscrew the spark plugs.

– Position piston of the relevant cylinder to dead centre.

– Screw the pressure hose in the spark plug thread.

– Connect pressure hose to compressed air.

– With the assistance of a second mechanic, lock the screw at the crankshaft on TDC position in order to avoid the displacement of the piston after pressure build-up.

– Build up a pressure of approx. 0.3 MPa (3 bar) in the combustion chamber.

– Determine how the pressure escapes:

1 - Via the inlet valve(s) - the pressure enters the throttle valve.

2 - Via the outlet valve(s) - the pressure enters the exhaust system.

3 - Via the piston rings - the pressure enters the cylinder block.

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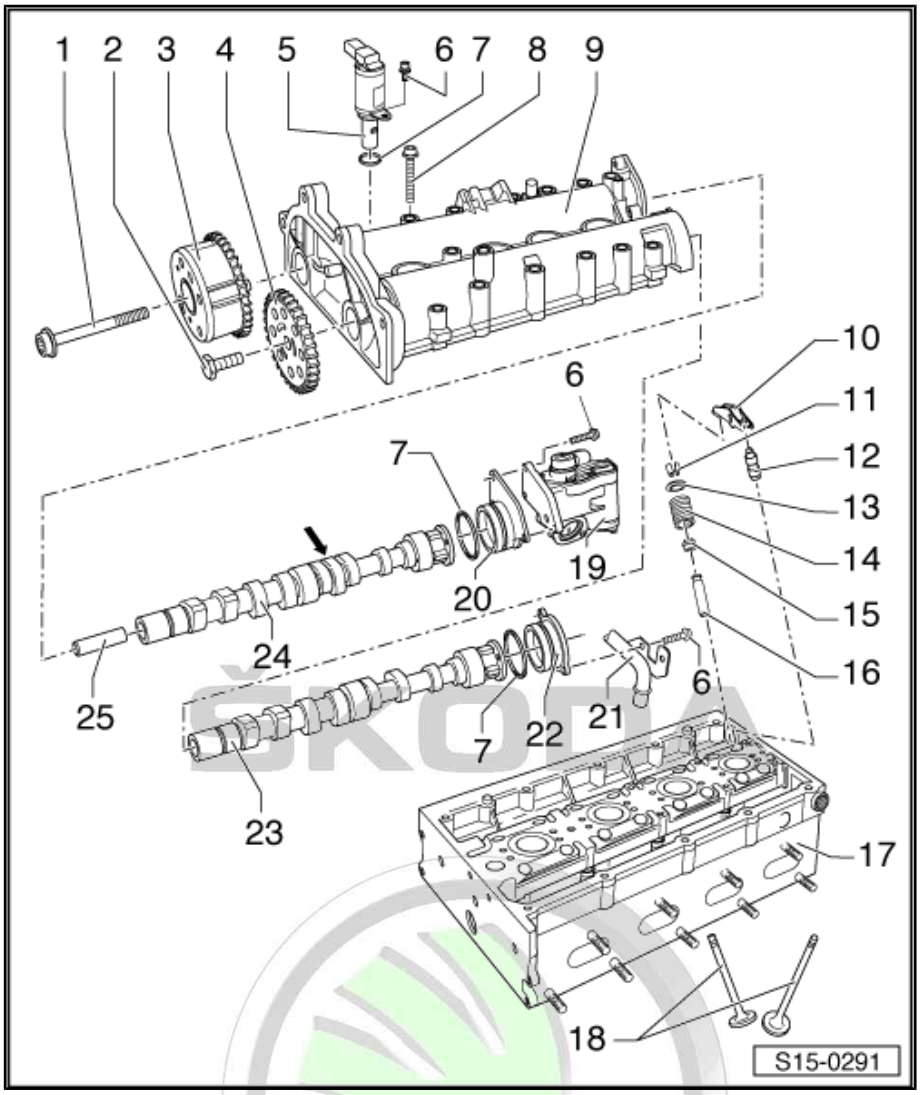
2 Valve gear

2.1 Assembly overview - valve gear



1 - 40 Nm + torque a further 90° (1/4 turn)

- ❑ Left-hand thread
- ❑ replace

2 - 50 Nm + torque a further 90° (1/4 turn)

- ❑ replace

3 - Camshaft adjuster

- ❑ must not be disassembled
- ❑ Removing and installing ⇒ page 58 , removing and installing the cam chain and oil pump drive chain

4 - Camshaft sprocket

- ❑ Observe the fitting position of the timing chain

5 - Inlet camshaft control valve 1 - N205 -

6 - 10 Nm

7 - O-ring

- ❑ replace if damaged

8 - 10 Nm + torque a further 90° (1/4 turn)

- ❑ replace
- ❑ unscrew from outside to inside
- ❑ tighten from inside to outside

9 - Camshaft housing

- ❑ with integrated camshaft bearings
- ❑ removing and installing ⇒ page 64
- ❑ remove old sealant residues
- ❑ Clean sealing surfaces, they must be free of oil and grease
- ❑ before positioning, apply sealant ⇒ ETKA - Electronic Catalogue of Original Parts
- ❑ When installing, position onto the pin bolts and fitted pins from the top

10 - Roller rocker arm

- ❑ inspect roller bearings
- ❑ oil contact surface
- ❑ for installing, clip onto the supporting element with the locking clip

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11 - Collets

12 - Hydraulic supporting element

- ❑ with hydraulic valve clearance compensation

- ❑ do not interchange
- ❑ before installing check axial play of the camshaft ⇒ page 75
- ❑ oil contact surface

13 - Valve spring retainer

14 - Valve spring

- ❑ removing and installing ⇒ page 79

15 - Valve stem seal

- ❑ replace ⇒ page 79

16 - Valve guide

- ❑ not to be replaced
- ❑ check ⇒ page 78

17 - Cylinder head

- ❑ reworking valve seats ⇒ page 75
- ❑ reworking sealing surface ⇒ page 75
- ❑ with oil strainer -Pos. 21- ⇒ page 49
- ❑ with sealing ring -Pos. 22- ⇒ page 49

18 - Valves

- ❑ do not rework, only grinding in is permissible
- ❑ Valve dimensions ⇒ page 75

19 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- ❑ removing and installing ⇒ page 166

20 - Screw cap

- ❑ For inlet camshaft

21 - Bracket for coolant pipe

22 - Screw cap

- ❑ For exhaust camshaft.

23 - Exhaust camshaft

- ❑ to remove, remove the camshaft housing ⇒ page 64
- ❑ do not mix up with inlet camshaft
- ❑ Inspecting axial play ⇒ page 75
- ❑ moisten with oil before installing (also axial bearing collar)

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24 - Inlet camshaft

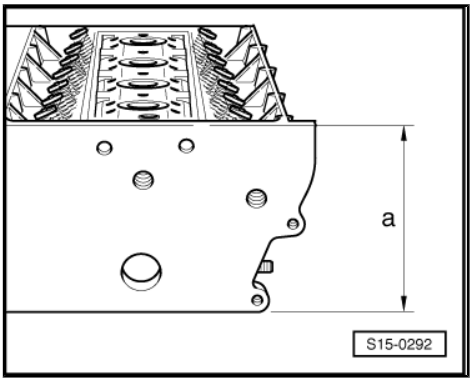
- ❑ to remove, remove the camshaft housing ⇒ page 64
- ❑ with cam for high pressure pump -arrow-
- ❑ before removing, remove the bucket tappet of the high pressure pump
- ❑ do not mix up with exhaust camshaft
- ❑ Inspecting axial play ⇒ page 75
- ❑ moisten with oil before installing (also axial bearing collar)

25 - Guide bushing

Reworking cylinder head sealing surface

Reworking dimension of cylinder head:

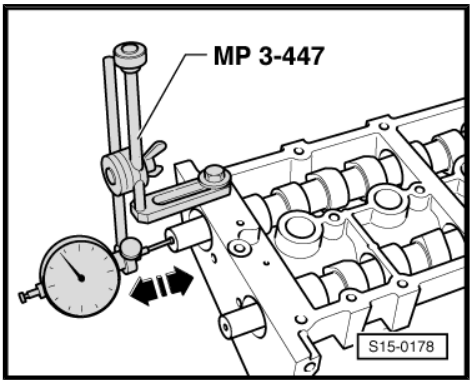
- -a- at least 108.25 mm



Note

- *Do not rework the sealing surface of the camshaft housing.*
- *If the sealing surface for the cylinder block is reworked, the valves should be set lower by the same amount (rework valve seat rings) otherwise the valves will strike the pistons. When doing this, ensure that the permissible minimum dimension is not exceeded* ⇒ page 76 .

Checking the axial play of the camshaft



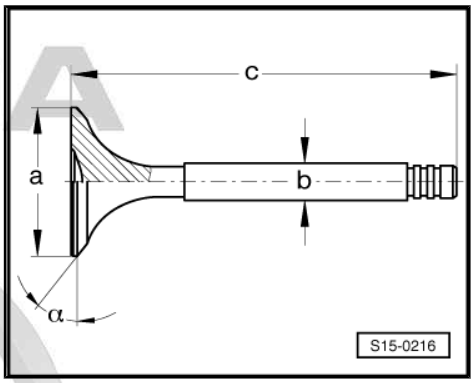
Special tools and workshop equipment required

- Universal dial gauge holder - MP 3-447 (VW 387)-
- Dial gauge

Carry out measurement with the camshaft housing removed and the end cover installed.

- Wear limit: 0.4 mm

Valve dimensions



Note

Valves must not be reworked. Only lapping-in is permitted.

Dimension		Inlet valve	Exhaust valve
∅ a	mm	29,5	26,0
∅ b	mm	5,973	5,953
c	mm	100,9	100,5
α	∠°	45	45

2.2 Reworking valve seats

Special tools and workshop equipment required

- Grinding paste
- Caliper gauge
- NAC milling cutter kit for reworking valve seats

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Note

- *When carrying out repairs on engines with leaking valves, it is not sufficient to machine or replace the valve seats and valves. It is also necessary to inspect the valve guides for wear, particularly on engines with a high mileage* ⇒ page 78 .
- *Rework valve seats only sufficiently in order to obtain a proper contact pattern. Calculate the maximum permissible reworking dimension before commencing. If the reworking dimension is exceeded, the proper operation of the hydraulic valve clearance compensation is no longer ensured. If this is the case replace the cylinder head.*

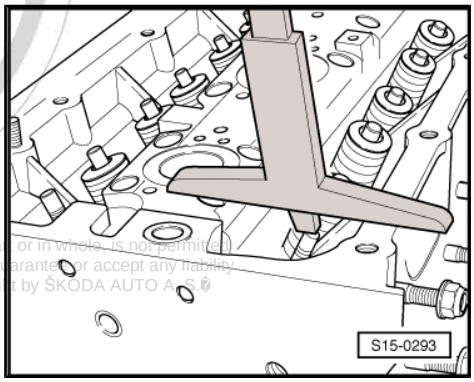
2.2.1 Calculating maximum permissible reworking dimension

– Insert valve and press firmly against the valve seat.

Note

If the valve is replaced when carrying out repair work, use a new valve for the measurement.

– Measure distance between the valve stem end and the upper face of the cylinder head.
– Calculate maximum permissible reworking dimension from measured distance and minimum dimension.



Minimum dimension: Inlet valve	7.6 mm
Minimum dimension: Exhaust valve	7.6 mm

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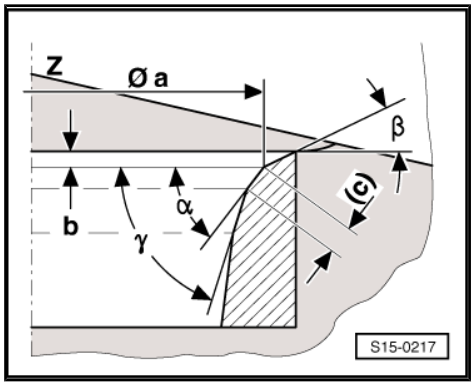
"Measured distance" - "minimum dimension" = "max. permissible reworking dimension".

Example:

Measured distance	8.0 mm
- Minimum dimension	7.6 mm
= max. permissible reworking dimension [1]	0.4 mm

1) The max. permissible reworking dimension is shown in the figures for reworking the valve seats as dimension "b".

Reworking inlet valve seat



a = ∅ 28.7 mm.

b = max. permissible reworking dimension

c = 1.5…1.8 mm

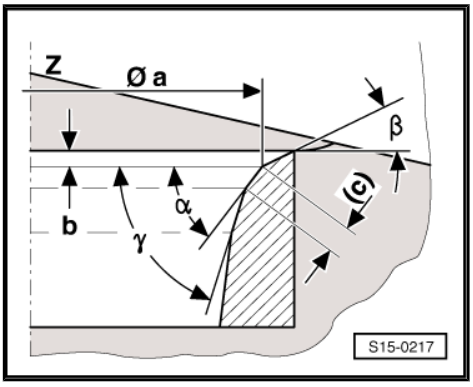
Z = Bottom edge of cylinder head

α = 45° valve seat angle

β = 30° top correction angle

γ = 60° bottom correction angle

Reworking exhaust valve seat



a = ∅ 25.0 mm.

b = max. permissible reworking dimension

c = approx. 1.8 mm

Z = Bottom edge of cylinder head

α = 45° valve seat angle

β = 30° top correction angle

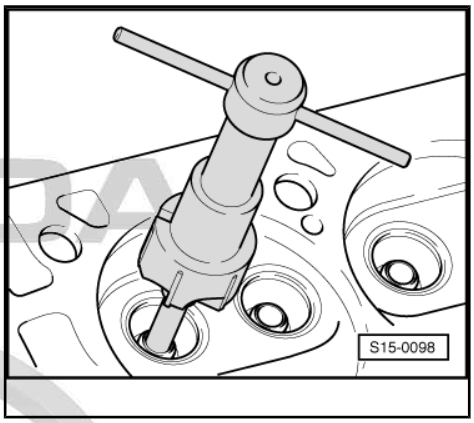
γ = 60° bottom correction angle

Work procedure

Reworking can be carried out by hand while complying with the following conditions:

- Wear limit of valve guides must not exceed the permissible dimension.
- Use NAC milling cutter with carbide metal tips (min. 90 HRC).
- Mill with the milling cutter using slight pressure in such a way that an even removal of swarfs is ensured over the whole working surface.

Reworking valve seats with NAC milling cutter



– Place cylinder head on a felt base and secure to prevent it from turning.

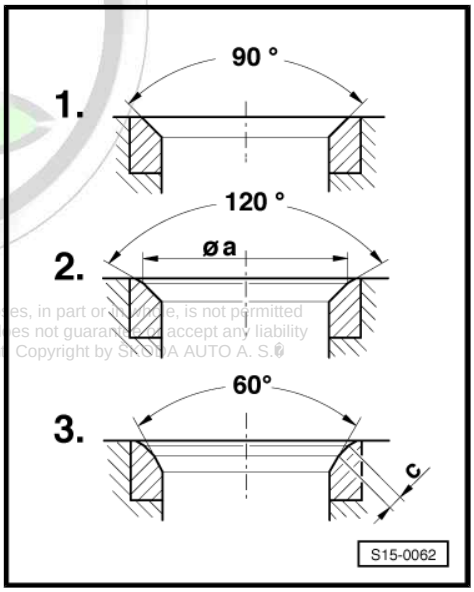
– Match diameter of guide drift to diameter of valve guide.

Valve guide	∅ Guide drift in mm
Inlet valve	$6,0^{-0,01}$
Exhaust valve	

– Match diameter of milling cutter to diameter of valve seat.

Valve seat	∅ Milling cutter 90° mm	∅ Milling cutter 120° mm	∅ Milling cutter 60° mm
Inlet valve	32	32	21/34
Exhaust valve	30	30	21/34

Milling sequence



1 - Mill valve seat with 90° milling cutter until a perfect contact pattern is achieved. (Do not exceed maximum permissible reworking dimension!)

2 - Chamfer top correction angle with 120° milling cutter until the valve seat diameter -a- is achieved ⇒ page 76 .

3 - Mill bottom correction angle with 60° milling cutter until valve seat width -c- is achieved ⇒ page 76 .

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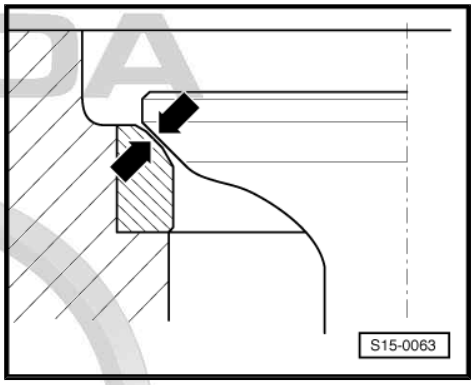
– Grind in valve/valve seat -arrows- with fine grinding paste so as to achieve a perfect contact pattern.
– Check contact pattern e.g. with water colour (perfect contact pattern over entire circumference).
– Install valve springs.
– Inspect valves for tightness.



The tightness of the valves can be checked by filling petrol into the inlet and outlet canal (no petrol must flow out at the valve seat).

After completing the repair measure once again the distances between the valve stem ends and the upper face of the cylinder head and calculate the maximum permissible reworking dimension.

Note

If the maximum permissible reworking dimension is exceeded, proper operation of the valve gear is no longer assured and the cylinder head must be replaced.

2.3 Inspect valve guides

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Special tools and workshop equipment required

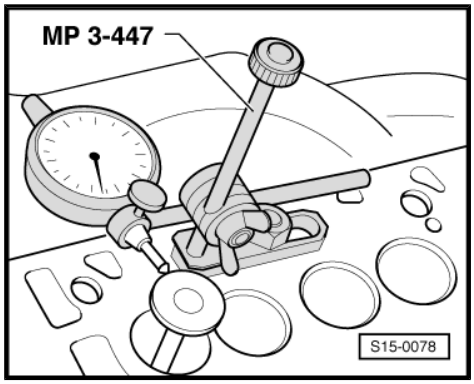
♦ Universal dial gauge holder - MP 3-447 (VW 387)-
♦ Dial gauge

Work procedure

Note

If the valve is replaced when carrying out repair work, use a new valve for the measurement.

– Insert valve into guide. The end of the valve stem must be flush with the guide. On account of differing stem diameters, only use inlet valve in inlet guide and exhaust valve in exhaust guide.
– Determine valve rock.
• Wear limit: 0.8 mm



Note

If the wear limit is exceeded, repeat measurement with new valves.

If the valve rock is exceeded:

– Renew cylinder head.

2.4 Replacing valve stem seals

2.4.1 Removing and installing valve stem seals (cylinder head installed)

Special tools and workshop equipment required

- Pressure hose - MP1-210 (VW 653/3)-
- Blank holder for valve spring - MP1-229 (3362)- with pressure plate - MP1-229/1 (3362/1)-
- Extractor - MP1-230 (3364)-
- Valve stem seal insertion tool - MP1-233 (3365)-

Removing

– Remove the camshaft housing ⇒ page 64 .

– Remove roller rocker arm and place on a clean surface. When doing this, ensure that roller rocker fingers are not interchanged.

– Remove ignition coils ⇒ page 168 and unscrew the spark plugs with spark plug wrench.

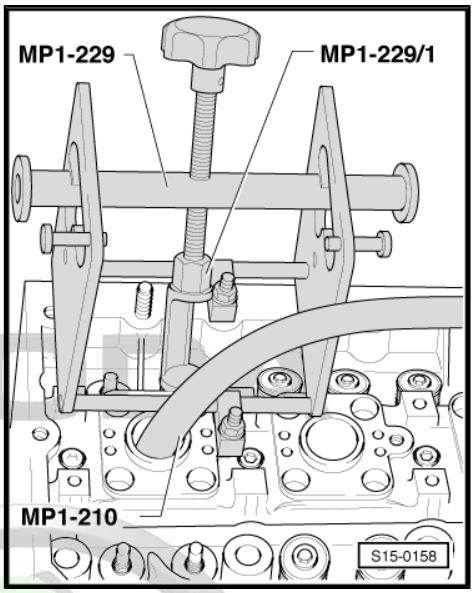
– Put the piston of the relevant cylinder at “bottom dead centre”.

– Screw on blank holder for valve spring - MP 1-229- with the pressure plate - MP 1-229/1- .

– Screw the pressure hose - MP 1-210- in the spark plug thread.

– Connect pressure hose to compressed air [min. 0.6 MPa (6° bar) overpressure] and remove the valve springs with blank holder for valve spring - MP 1-229- .

– Pull off valve stem seal with extractor for valve stem seal - MP 1-230- .



Install

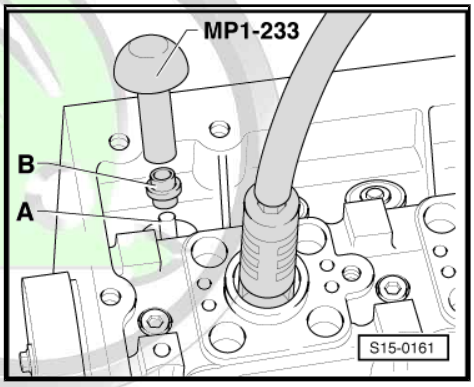
– Insert the supplied plastic bushings on the relevant valve stem. This will prevent any damage to the new valve stem seals.

– Insert the new valve stem seal -B- in the insertion tool for valve stem seal -MP 1-233- .

– Oil the sealing lip of the valve stem seal and carefully slide onto the valve guide -A-.

– Install again valve springs.

– Install camshaft housing ⇒ page 64 .



Further installation occurs in a similar way in reverse order to removal.

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2.4.2 Removing and installing valve stem seals (cylinder head removed)

Special tools and workshop equipment required

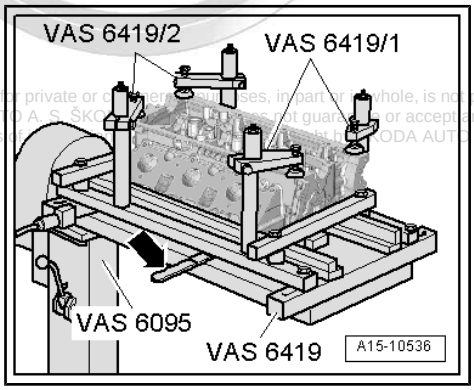
- Blank holder for valve spring - MP1-229 (3362)- with pressure plate - MP1-229/1 (3362/1)-
- Extractor - MP1-230 (3364)-
- Valve stem seal insertion tool - MP1-233 (3365)-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

Removing

– Remove roller rocker arm and place on a clean surface. When doing this, ensure that roller rocker fingers are not interchanged.

– Insert the cylinder head tensioning device - VAS 6419- into the engine and gearbox jack - VAS 6095- .

– Tension the cylinder head in the cylinder head tensioning device, as shown in the illustration.



– Connect cylinder head tensioning device to compressed air.

– Adjust the air bellows with the lever -arrow- below the combustion chamber on which the valve stem seals should be removed.

– Allow just enough air to flow into the air bag so that it applied to the valve disc.

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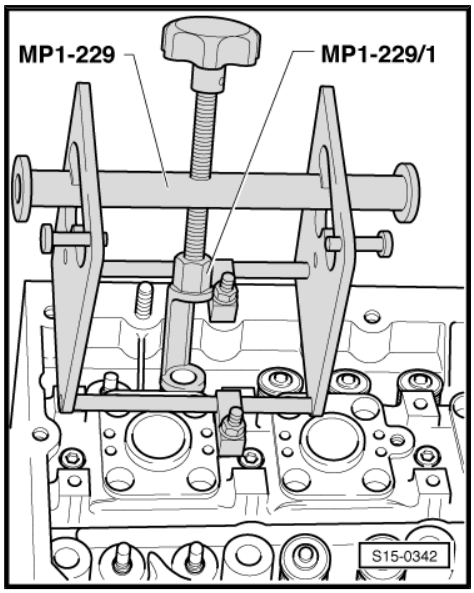
– Screw on blank holder for valve spring - MP1-229- with pressure plate - MP1-229/1- .

– Remove valve springs with blank holder for valve spring - MP1-229- .

– Pull off valve stem seal with extractor for valve stem seal - MP1-230- .

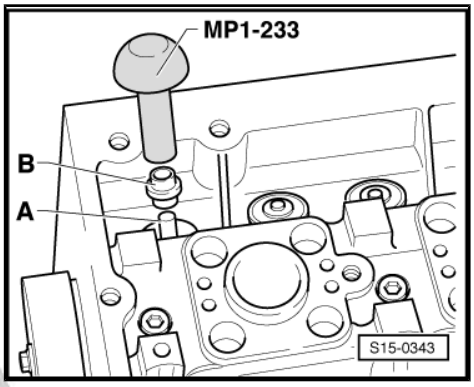


Install

– Place plastic sleeve supplied on respective valve stem. This will prevent damage to new valve stem seal.

– Insert the new valve stem seal -B- in the insertion tool for valve stem seal - MP1-233- .
– Oil the sealing lip of the valve stem seal and carefully slide onto the valve guide -A-.
– Install again valve springs.

Further installation occurs in reverse order to removal.



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17 – Lubrication

1 Removing and installing parts of the lubrication system

Caution

If considerable quantities of metal swarf or abrasion is found when carrying out an engine repair, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:

Carefully clean the oil galleries.

Replace engine oil cooler.

Replace oil filter element.

Inspecting oil pressure ⇒ page 91

Check the engine oil, amount of oil and oil specification ⇒ Maintenance ; Booklet Octavia II

1.1 Lubrication system - Summary of components

The oil pressure switch - F1- is located in the front left cylinder head; removing and installing ⇒ page 49 .

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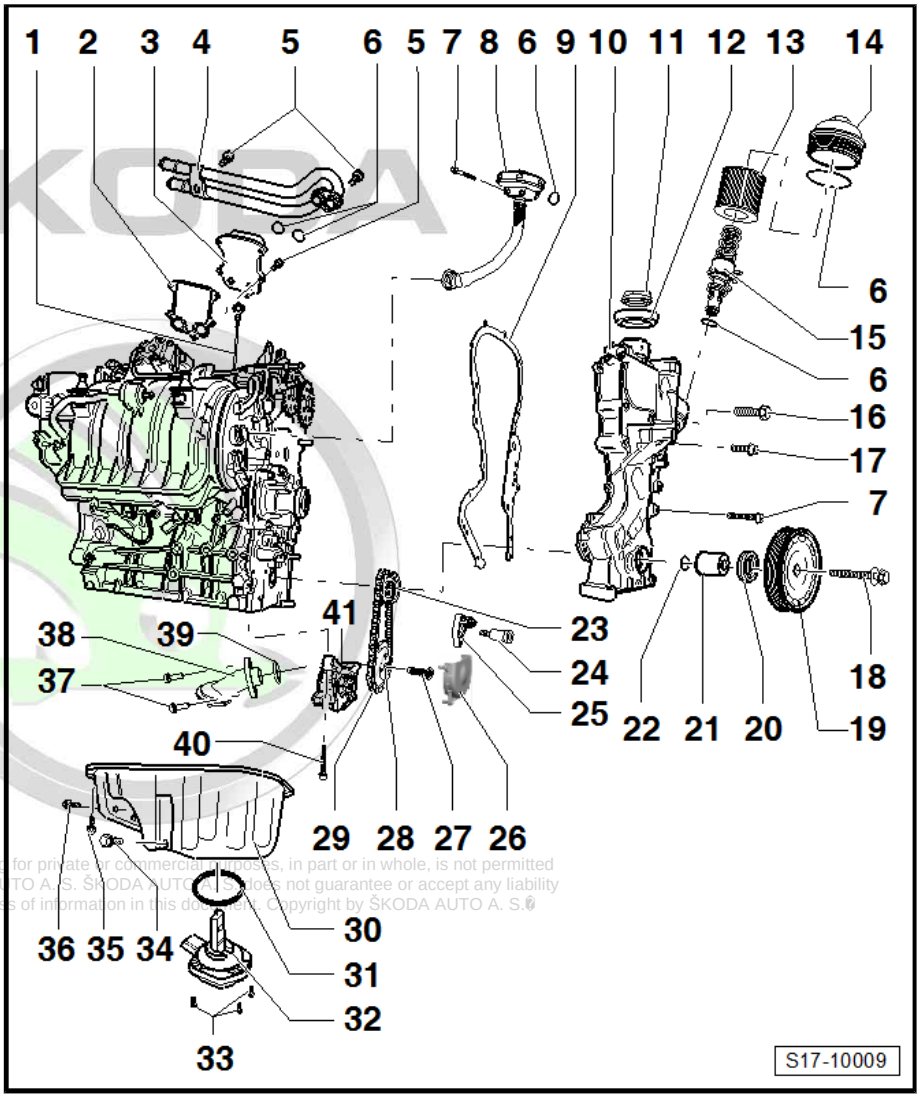

1 - Dipstick

- ❑ Oil level must not exceed max. marking

2 - Gasket

- ❑ replace

3 - Engine oil cooler

4 - Coolant pipes

- ❑ for engine oil cooler

5 - 8 Nm

6 - O-ring

- ❑ replace

7 - 10 Nm

8 - Pressure relief valve (PCV valve)

- ❑ with ventilation hose

9 - Gasket

- ❑ replace

10 - Timing case

- ❑ removing and installing ⇒ page 26

11 - Screw cap

- ❑ Replace seal if damaged

12 - Sealing ring

- ❑ replace if damaged

13 - Filter element

14 - Oil filter cover, 25 Nm

15 - Valve

- ❑ with short circuit valve

  Opening pressure: 0.25 MPa (2.5 bar) overpressure

- ❑ with return-flow check tube

16 - 50 Nm

17 - 10 Nm

- ❑ M6x22 mm

18 - Fixing screw

- ❑ for vibration damper
- ❑ replace
- ❑ The contact surface of the fixing screw must be free of grease and oil.
- ❑ tighten ⇒ page 35

19 - Vibration damper

- ❑ The contact surfaces of the vibration damper must be free of grease and oil.
- ❑ Removing and installing V-ribbed belt ⇒ page 22

20 - Gasket ring for crankshaft in timing case

- ❑ replace ⇒ page 33

21 - Distance sleeve

- ❑ The clamping surfaces of the bushing must be free of grease and oil.

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- ❑ install with new O-ring -Position 22-

22 - O-ring

- ❑ replace
- ❑ in the distance sleeve -Position 21-

23 - Sprocket

- ❑ for oil pump drive
- ❑ removing and installing ⇒ page 58

24 - Carrier bolt for tightener, 15 Nm

25 - Chain tensioner

- ❑ for oil pump drive
- ❑ only be replaced as a complete unit

26 - Cover

- ❑ for chain sprocket of the oil pump
- ❑ clipped into oil pump housing

27 - 20 Nm + torque a further 90° (1/4 turn)

- ❑ replace

28 - Sprocket

- ❑ for oil pump
- ❑ Counterhold sprocket with counterholder - T10172-

29 - Chain

- ❑ for oil pump
- ❑ mark running direction (installed position) before removing
- ❑ removing and installing ⇒ page 58

30 - Oil pan

- ❑ removing and installing ⇒ page 85

31 - Sealing ring

- ❑ replace
- ❑ Moisten with oil before installing

32 - Oil level and oil temperature sender - G266 -

- ❑ replace if damaged

33 - 10 Nm

34 - Oil drain plug, 30 Nm

- ❑ with captive seal
- ❑ replace

35 - 13 Nm

- ❑ replace
- ❑ Slacken and tighten the bolts at the gearbox side with socket insert - T10058-

36 - 40 Nm

37 - 10 Nm

38 - Suction line

39 - O-ring

- ❑ replace

40 - 14 Nm + torque a further 90° (1/4 turn)

- ❑ replace

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41 - Oil pump

❑ removing and installing ⇒ page 87

1.2 Removing and installing oil pan

Special tools and workshop equipment required

- Offset screwdriver - T10058-
- Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- Cleaning and degreasing agent , e.g. -D 009 401 04-
- Silicone sealant ⇒ ETKA - Electronic catalogue of original parts

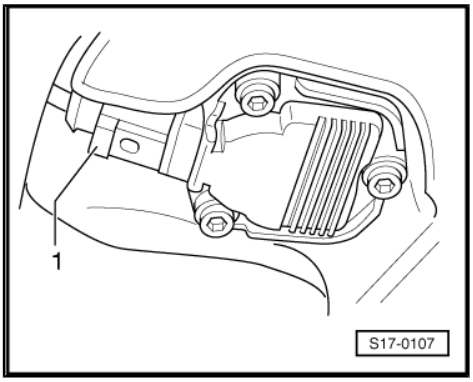
Removing

– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .

– Drain engine oil ⇒ Maintenance ; Booklet Octavia II .

– Remove pre-exhaust pipe with catalytic converter ⇒ page 161 .

– Disconnect plug at oil level and oil temperature sender - G266- .



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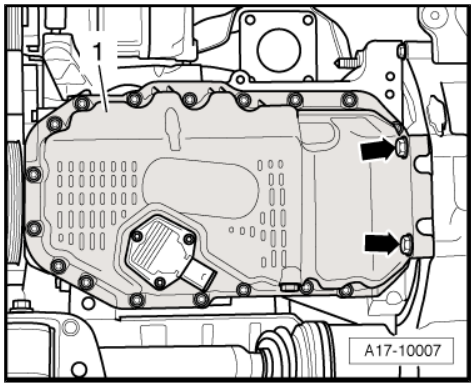
– Unscrew the bolts of oil pan/gearbox -arrows-.



Note

Loosen two screws on gearbox side using socket insert - T10058- .

– Loosen oil pan bolts -1- crosswise and release.

– Remove oil pan, if necessary release by applying slight blows with a rubber-headed hammer.

WARNING

Wear protective gloves and goggles when working with gasket remover and degreasing agent!

– Remove the remaining sealant on the cylinder block and on the oil pan with chemical sealant remover.

– Degrease the sealing surfaces.

Install

Note

- *Replace M6 oil pan bolts.*
- *Pay attention to the use by date on sealant.*
- *The oil pan must be installed within 5 minutes after applying the silicone sealant.*

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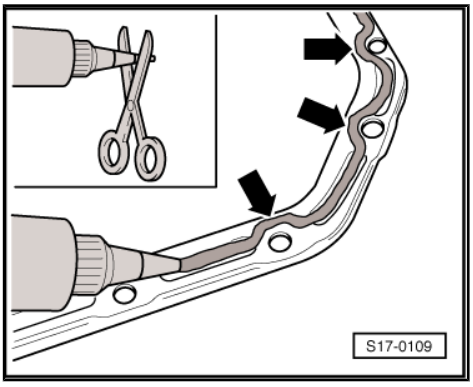
– Cut off nozzle tube at the front marking (∅ of nozzle approx. 3 mm).

– Apply silicone sealant to the clean sealing surface of the oil pan, as shown in the illustration. Sealant bead must

♦ 2…3 mm thick

♦ run past the area around the bolt holes on the inside -arrows-



Note

The sealing compound bead must not be thicker, otherwise excessive sealing compound will enter the sump and may block the oil suction pipe strainer.

– Fit sump immediately and lightly tighten all sump securing bolts.

Note

♦ *When installing the oil pan with the engine removed, ensure that the oil pan is flush with the cylinder block at the flywheel side.*

♦ *Pay attention when inserting the oil pan bolts on the flywheel side that the oil pan bolts are inserted in the holes and not between the cylinder block and the flywheel.*

♦ *If the oil pan bolts are inadvertently inserted between the cylinder block and the flywheel and can no longer be pulled out, the oil pan must be removed again, the sealing surfaces must be cleaned and the silicone sealant must be replaced.*

– Tighten the oil pan bolts.

Screws M6: 13 Nm

Screws M10: 40 Nm

Note

After installing the oil pan, allow the sealant to dry for about 30 minutes. Only then may engine oil be filled in.

1.3 Removing and installing oil pump

Special tools and workshop equipment required

♦ Counterholder - T10172-

Removing

– Removing the oil pan ⇒ page 85 .

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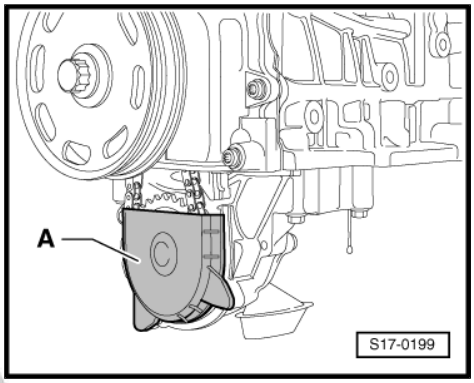
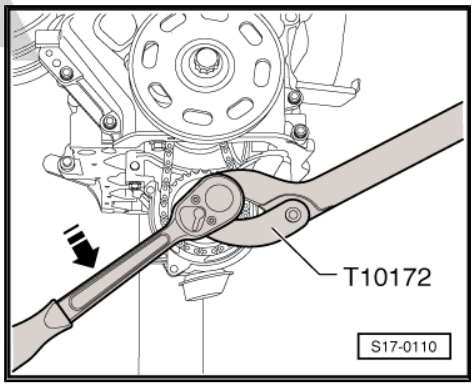
– Unclip the cover for the chain sprocket of the oil pump -A-.
– Hold the chain sprocket of the oil pump with the counterholder - T10172- .



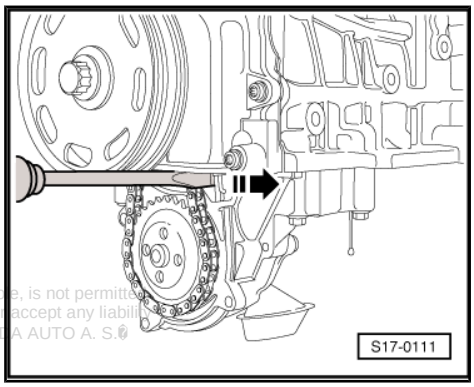
– Loosen the fixing screw of the chain sprocket.

Note

Do not unscrew the bolt yet.



– Press chain tensioner with a screwdriver in -direction of arrow-.
– Release the fixing screw of the chain sprocket.
– Remove chain sprocket from the oil pump and from the chain.



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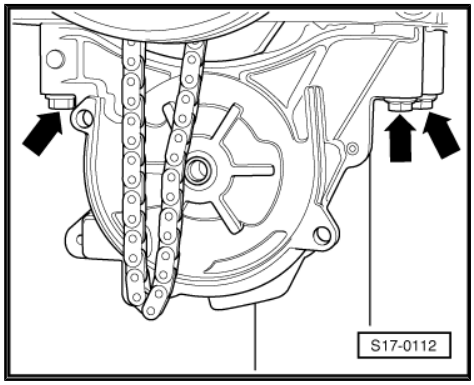
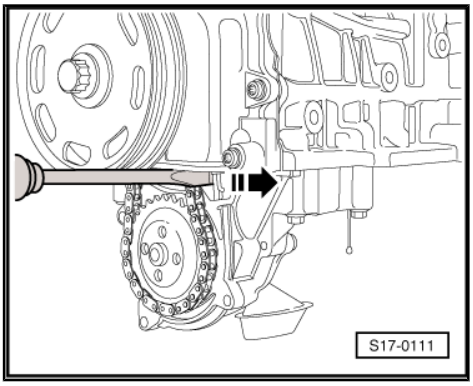
– Unscrew fixing bolts of the oil pump -arrows-.
– Remove the oil pump from the cylinder block.

Install

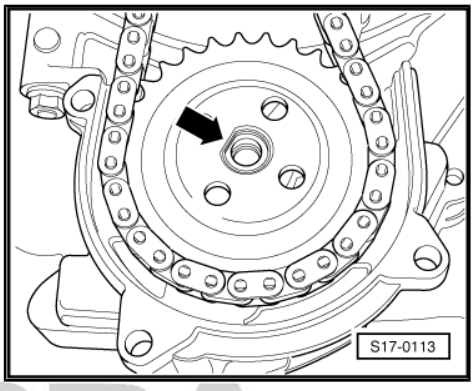
• Replenish oil pump with oil before installation.



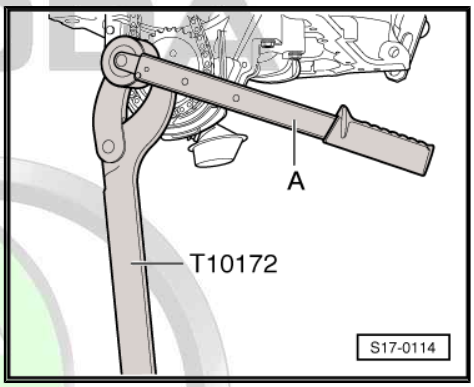
– Press chain tensioner with a screwdriver in -direction of arrow-.
– Insert the chain sprocket into the chain and position on the shaft of the oil pump.



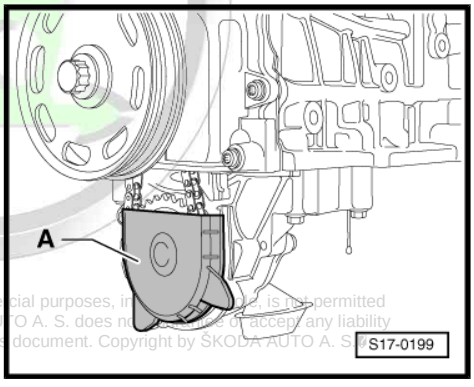
– Pay attention to the seating of the chain sprocket on the shaft of the oil pump -arrow-.
– Screw in new fixing screw for chain sprocket.



– Counterhold the chain sprocket with the counterholder -T10172- .
– Position the torque wrench -A- as shown.
– Tighten new fixing bolt to 20 Nm + torque a further 90° (1/4turn).



– Install the cover for the chain sprocket of the oil pump -A-.
– Installing the oil pan ⇒ page 85 .



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1.4 Removing and installing engine oil cooler

Special tools and workshop equipment required

- Hose clamps up to 25 mm - MP7-602 (3094)-
- Pliers for spring strap clamps
- Catch pan , e.g. -VAS 6208-

Removing

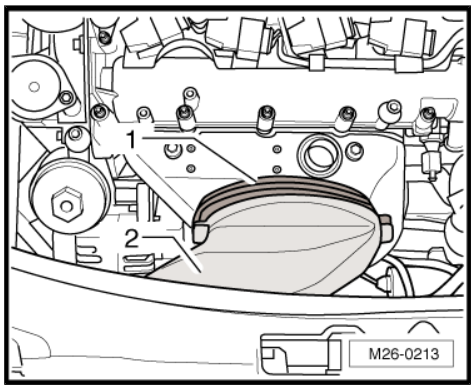
– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .

– Drain coolant ⇒ page 98 .

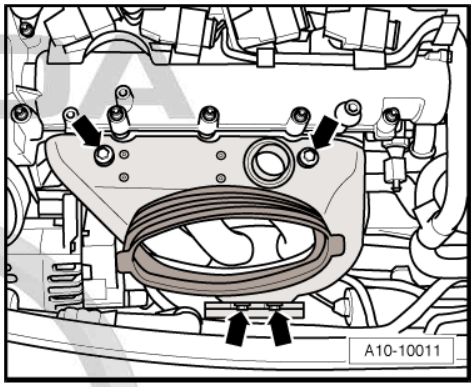
– Remove engine trim panel with air filter ⇒ page 145 .

– Separate the rubber bellows -1- from the air guide -2-.

– Remove both catches and remove the air guide -2-.



– Unscrew heat shield -arrows-.



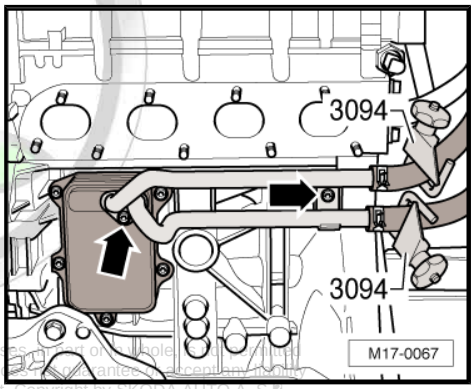
– Remove coolant hoses from the engine oil cooler with hose clamps up to 25 mm - MP7-602- .

– Unscrew fixing screws -arrows- for coolant pipes at cylinder block and at engine oil cooler.

– Remove the generator ⇒ Rep. gr. 27 ; Electrical System .

– Position catch pan underneath.

– Pull out the coolant pipes towards the front out of the engine oil cooler.



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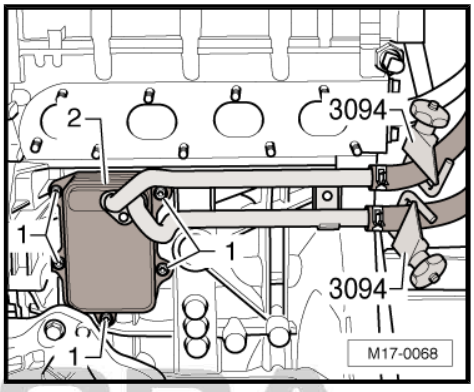
– Release screws -1- and remove engine oil cooler -2- from the cylinder block.



Install

Installation is carried out in the reverse sequence. Pay attention to the following:

Note

Replace O-ring.

– If the engine oil cooler was replaced, refill or renew coolant ⇒ page 98 .

Install generator ⇒ Rep. gr. 27 ; Electrical System .

Tightening torques

1.5 Testing oil pressure and oil pressure switch

Special tools and workshop equipment required

- Oil pressure tester , e.g. -V.A.G 1342 -
- Voltage tester , e. g. -V.A.G 1527 B-
- Measuring tool set , e.g. -V.A.G 1594 C-
- Vehicle Diagnosis, Measurement and Information System - VAS/ODIS-

Conditions

- Engine oil level o.k., test ⇒ Maintenance ; Booklet Octavia II
- Coolant temperature at least 80°C (radiator fan must have run at least once).

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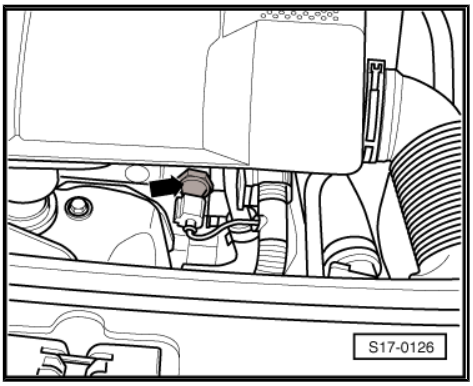
Note

Functional test and repair of the visual and acoustic oil pressure display ⇒ Current flow diagrams, Electrical fault finding and Fitting locations, ⇒ Vehicle diagnostic tester.

Test sequence

– Remove oil pressure switch in the front left of the cylinder head -arrow-.



– Screw oil pressure switch into the test equipment.
– Screw tester into cylinder head in place of oil pressure switch.
– Connect brown wire of tester to earth (-).
– Connect voltage tester to battery positive terminal and to oil pressure switch.

• The LED must not light up.

If the LED lights up:

– Replace oil pressure switch - F1- .

If the LED does not light up:

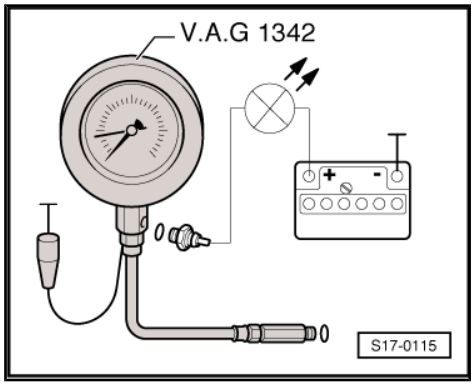
– Start engine and increase engine speed.

• The LED must light up at an oil overpressure of 0.03…0.07 MPa (0.3...0.7 bar), if not replace oil pressure switch.

– Increase engine speed further.

• At 2000 rpm and an oil temperature of 80°C the oil overpressure should be at least 0.2 MPa (2 bar).

• At a higher engine speed the oil overpressure must not be greater than 0.7 MPa (7 bar).



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19 – Cooling

1 Cooling system

WARNING

Hot steam or hot coolant may escape when the compensation bottle is opened. Cover the cap with a cloth and open carefully.

Note

- *When the engine is warm the cooling system is under pressure. If necessary reduce pressure before repairs.*
- *The hose connections are secured with spring-type clips. In the event of repairs only use spring-type clips.*
- *Use pliers for spring strap clips to fit the spring strap clips.*
- *Always replace seals and gasket rings.*
- *When installing fit the coolant hoses free of stress, without them touching any other components (pay attention to the markings on the coolant connections).*
- *The arrows affixed to the coolant pipes and the coolant hoses must stand opposite to each other.*

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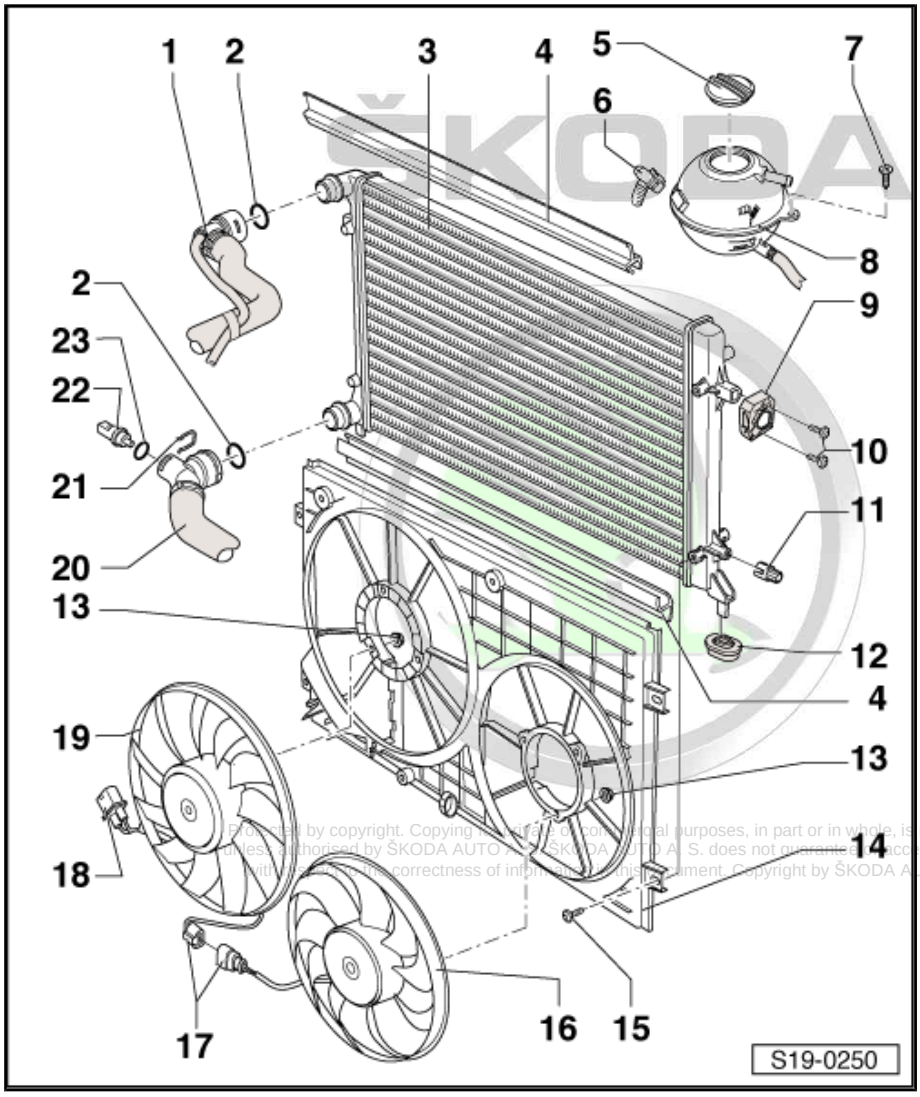
1.1 Parts of cooling system on the side next to the body - Summary of components



1 - Top coolant hose

- To connection fitting at cylinder head

2 - O-ring

- replace if damaged

3 - Radiator

- removing and installing ⇒ page 101
- after replacing fill entire system with fresh coolant

4 - Gasket

5 - Screw cap

- Testing the pressure relief valve in the cap ⇒ page 104

6 - Connector

7 - 3 Nm

8 - Expansion reservoir

- with coolant shortage warning light sender - G32-
- Check the cooling system for tightness ⇒ page 104

9 - Support

- for radiator

10 - 7 Nm

11 - Spacer

- for bracket for coolant lines

12 - Rubber bearing

- 2 pieces
- inserted in the lock carrier

13 - 5 Nm

14 - Fan shroud

- removing and installing ⇒ page 100

15 - 5 Nm

16 - Right radiator fan - V35-

- removing and installing ⇒ page 100

17 - Connector

18 - Connector

19 - Radiator fan - V7-

- removing and installing ⇒ page 100

20 - Bottom coolant hose

- check tightness
- connection diagram for coolant hoses ⇒ page 97

21 - Retaining clip

- only on vehicles with air conditioning installed

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- ❑ check tightness

22 - Thermoswitch or sender

Vehicles without air conditioning system:

- ❑ Thermoswitch for radiator fan - F18-
- ❑ Tightening torque: 35 Nm

Vehicles with air conditioning:

- ❑ Coolant temperature sender at radiator outlet - G83-

23 - O-ring

- ❑ replace

1.2 Coolant regulator - Summary of components

1 - Connection fittings

2 - O-ring

- ❑ replace

3 - Pressure spring

4 - Coolant temperature sender - G62-

- ❑ before removing, reduce pressure in cooling system if necessary

5 - Tappet

6 - Retaining clip

- ❑ check tightness

7 - 10 Nm

8 - Thermostat housing

9 - Sealing ring

- ❑ replace

10 - to heat exchanger

- ❑ connection diagram for coolant hoses ⇒ page 97

11 - from heat exchanger

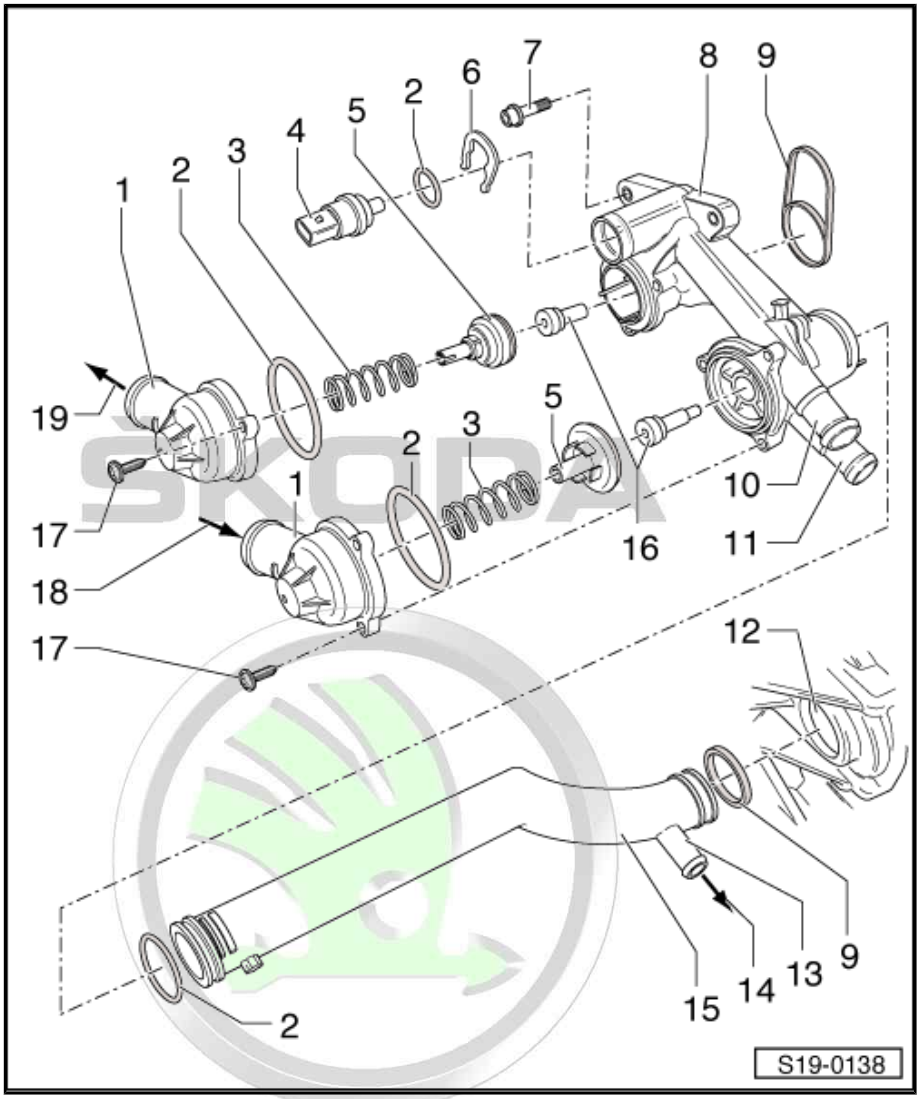
- ❑ connection diagram for coolant hoses ⇒ page 97

12 - Cooling pump housing at cylinder block

13 - Connection fittings

14 - to the expansion reservoir

- ❑ connection diagram for coolant hoses ⇒ page 97



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15 - Coolant pipe

- ❑ connection diagram for coolant hoses ⇒ page 97

16 - Coolant regulator

- ❑ Control range

  long thermal element: 87 °C … 102 °C

short thermal element: 103 °C … 120 °C

17 - 5 Nm

18 - from bottom of radiator

- ❑ connection diagram for coolant hoses ⇒ page 97

19 - towards top radiator

- ❑ connection diagram for coolant hoses ⇒ page 97

1.3 Coolant pump - Summary of components

1 - Coolant pump

- ❑ removing and installing ⇒ page 103
- ❑ check smooth operation
- ❑ with integrated gasket ring
- ❑ replace completely if damaged or leaking

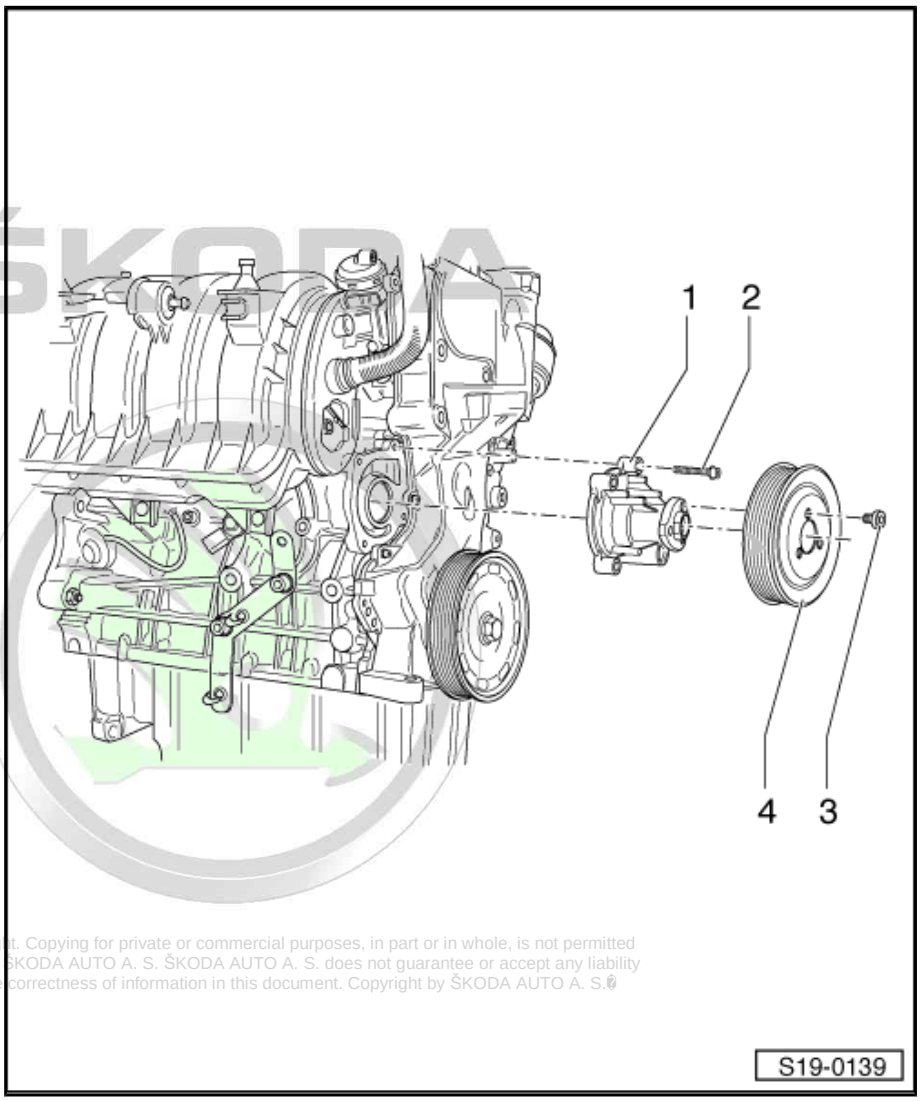
2 - 9 Nm

3 - 20 Nm

- ❑ When loosening and tightening, use the adapted wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- ⇒ page 103

4 - Belt pulley

- ❑ Removing and installing V-ribbed belt ⇒ page 22



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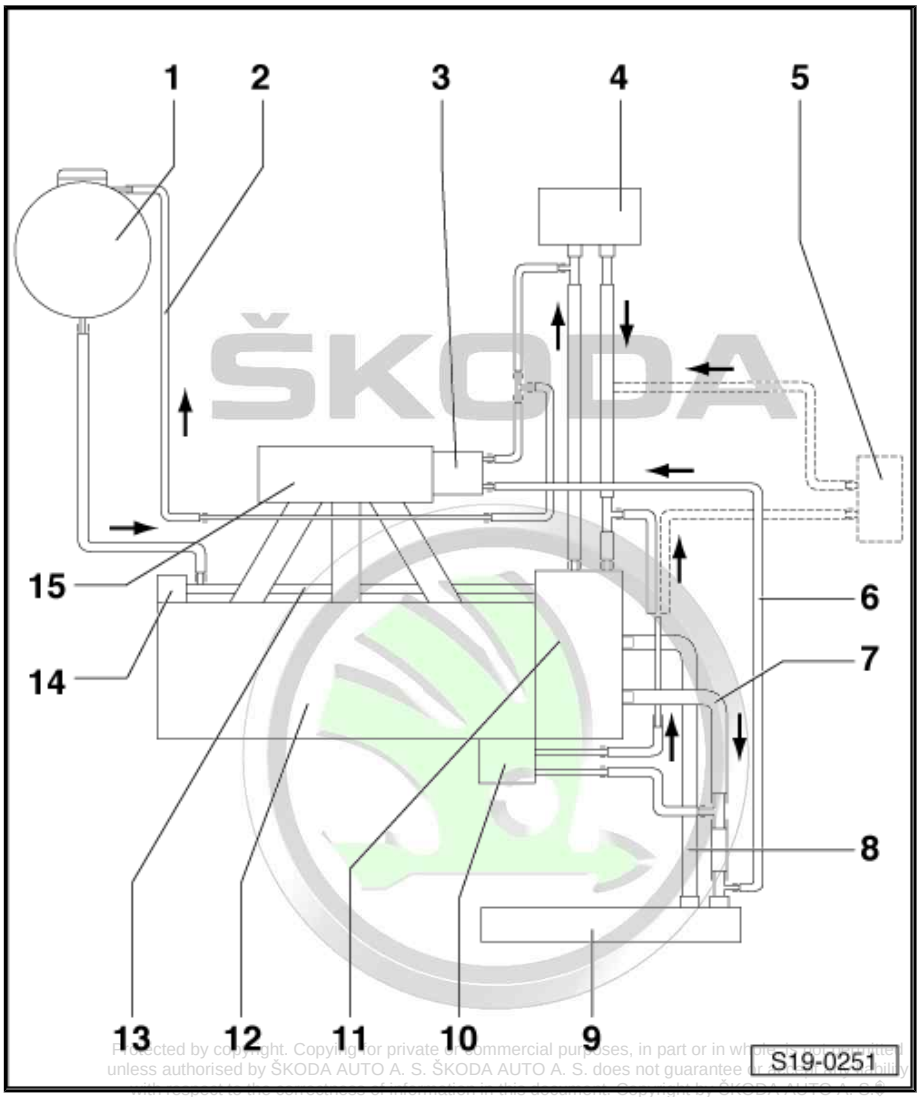
1.4 Coolant hose schematic diagram

Vehicles without auxiliary heating.



1 - Expansion reservoir

2 - Coolant hose

- ❑ for exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

3 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

4 - Heat exchanger for heating

5 - Gearbox oil cooler

- ❑ only on vehicles with automatic gearbox

6 - Coolant hose

- ❑ for exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

7 - Top coolant hose

8 - Bottom coolant hose

9 - Radiator

10 - Engine oil cooler

11 - Thermostat housing

12 - Cylinder head and cylinder block

13 - Coolant pipe

14 - Coolant pump

15 - Intake manifold

Vehicles with auxiliary heating.

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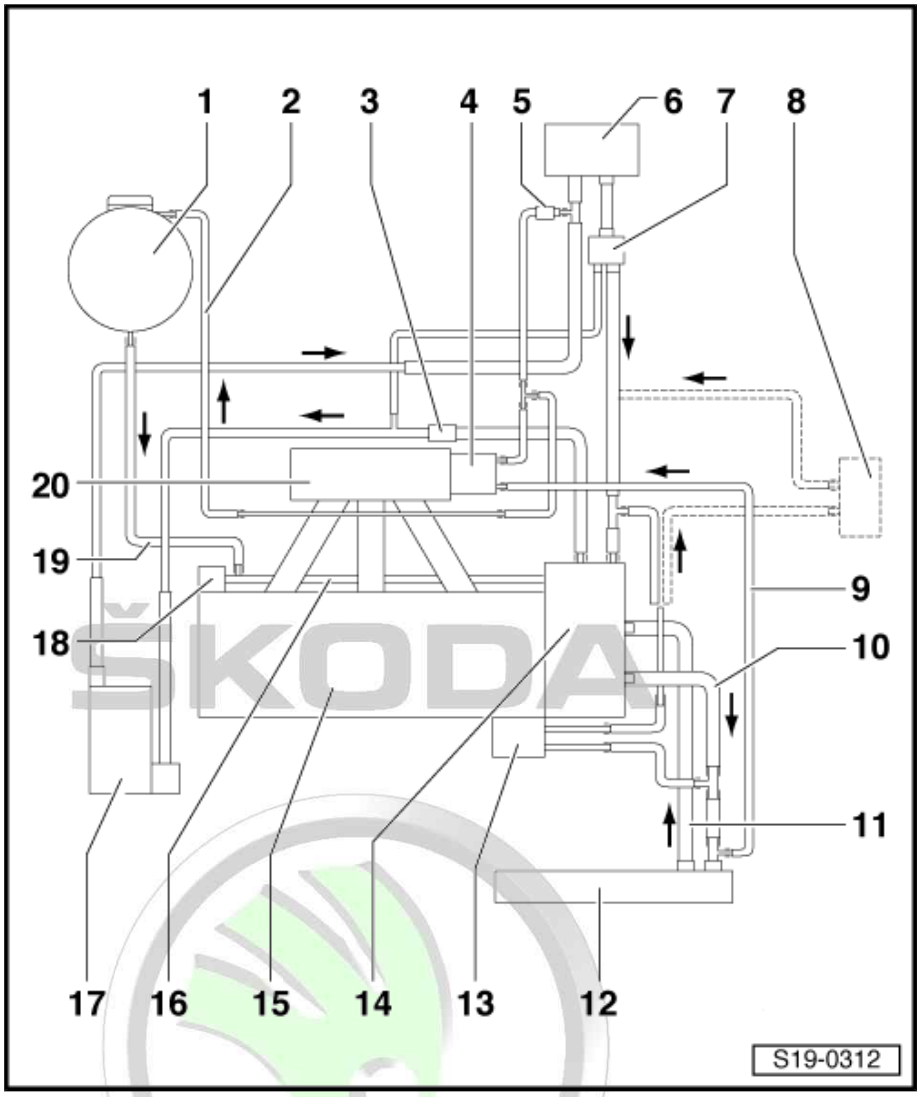

1 - Expansion reservoir

- ❑ with cap
- ❑ Testing the pressure relief valve in the cap ⇒ page 104

2 - Coolant hose

- ❑ for exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

3 - Non-return valve

4 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

5 - Non-return valve

- ❑ integrated into the coolant hose
- ❑ not visible from the outside

6 - Heat exchanger for heating

- ❑ fill with fresh coolant after replacing

7 - Heater coolant shut-off valve - N279-

8 - Gearbox oil cooler

- ❑ only on vehicles with automatic gearbox

9 - Coolant hose

- ❑ for exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

10 - Top coolant hose

11 - Bottom coolant hose

12 - Radiator

13 - Engine oil cooler

14 - Thermostat housing

15 - Cylinder head and cylinder block

16 - Coolant pipe

17 - Auxiliary heating

- ❑ only for vehicles with special equipment

18 - Coolant pump

19 - Coolant hose

20 - Intake manifold

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1.5 Draining and filling up coolant

Special tools and workshop equipment required

- Catch pan , e.g. -VAS 6208-
- Pliers for spring strap clamps
- Refractometer
- Protective goggles and gloves

Draining

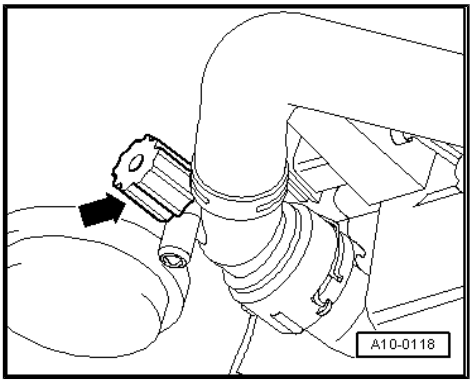
Note

- *The drained coolant must not be re-used.*
- *Dispose of drained oil.*
- *Observe the disposal instructions.*

WARNING

Hot steam may escape when the coolant expansion reservoir is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.

– Open the cap of the coolant expansion reservoir.
– Remove the sound dampening system ⇒ Body Work; Rep. gr. 50 .
– Position drip tray (e.g. -V.A.S 6208-) under the engine.
– Turn the drain plug -arrow- on the radiator to the left and to the rear; fit auxiliary hose onto connection if necessary.



Filling up

Note

- *The drained coolant must not be re-used.*
- *The cooling system is filled all year round with a mixture of distilled water and coolant additive with anti-corrosion agent.*

– Select the appropriate coolant additive from the ⇒ ETKA - Electronic catalogue of original parts .
– In a clean reservoir, mix distilled water and coolant additive in the specified mixing ratio⇒ Maintenance ; Booklet Octavia II .

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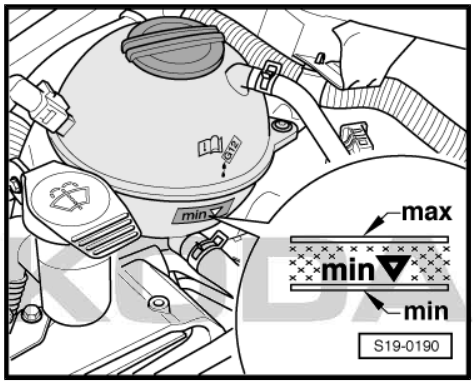
– Fill up coolant up to max. marking on the expansion reservoir.



– Fit expansion tank cap.
– Switch off the air-conditioning system and the heating.

Vehicles without auxiliary heating.

– Start the engine and maintain the engine speed for about 3 minutes at approx. 2000 r.p.m.
– Run engine until radiator fan - V7- starts.

Vehicles with auxiliary heating.

Caution

The auxiliary heating must only be switched on, if the refrigerant circuit is filled up -as described below-.

– Connect ⇒ Vehicle diagnostic tester.
– Start the engine and maintain the engine speed for about 3 minutes at approx. 2000 r.p.m.
– On the display press consecutively the buttons for “Vehicle self-diagnosis”,“18 - Auxiliary heating” and “03 - Actuator diagnosis”.
– Press the right arrow on the display so often until the coolant shut-off valve of heating system - N279- is shown.
– Perform self-diagnosis for the coolant shut-off valve of heating system - N279- and maintain the engine speed at approx. 2000 rpm for about 1 minute.
– Run engine until radiator fan - V7- starts.

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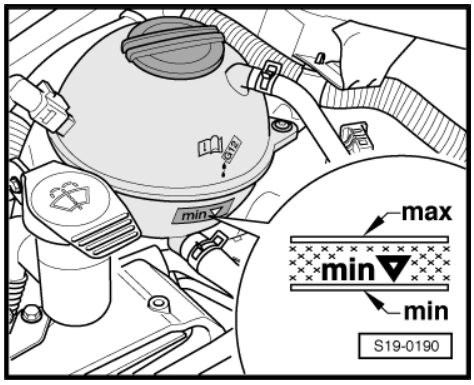
Continued for all vehicles

– Check coolant level when the expansion reservoir is closed.



• When engine is at operating temperature the coolant level must be at the maximum marking, when engine is cold between the minimum and the maximum markings.

WARNING

Hot steam may escape when the coolant expansion reservoir is opened. Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding. Cover the cap with a cloth and open carefully.

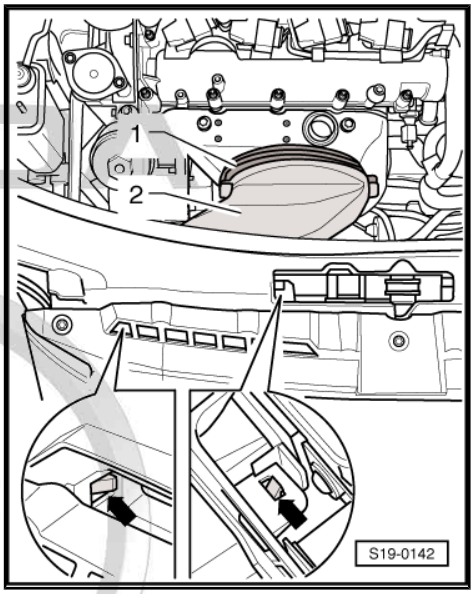
– If necessary, top up with coolant.
– Install the noise insulation ⇒ Rep. gr. 50 ; Body Work .

1.6 Removing and installing fan shroud for radiator fan - V7- and - V35-

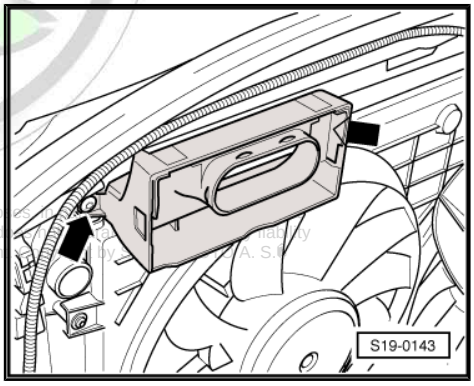
Removing

– Remove engine trim panel with air filter ⇒ page 145 .

– Disconnect bellows -1- (if present) from the air guide -2-.
– Remove both retaining tabs -arrows- and remove air guide.



– Unscrew air guide from lock carrier -arrows-.
– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .



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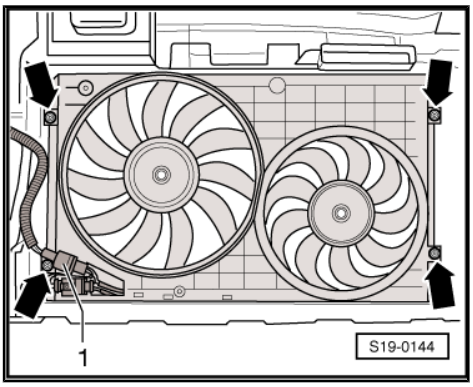
– Disconnect the plug connection -1- and unscrew the fixing screws for fan shroud -arrows-.
– Remove fan shroud with fans downwards.



Install

Installation is carried out in the reverse sequence.

1.7 Removing and installing radiator

Special tools and workshop equipment required

♦ Catch pan , e.g. -VAS 6208-
♦ Pliers for spring strap clamps

Removing

– Drain coolant ⇒ page 98 .
– Remove connector from the Thermoswitch/sender at the coolant hose support at the bottom cooler.
– Remove support for coolant hose from bottom cooler.
– Remove fan shroud for radiator fan - V7- and - V35 - ⇒ page 100 .

– Remove coolant hose at top of radiator.

Vehicles without air conditioning

– Unscrew fixing screws for radiator bearing on right and left ⇒ page 93 .

– Unhook the radiator out of the lower bearings and remove it downwards.

Vehicles with air conditioning

– Remove front bumper ⇒ Rep. gr. 63 ; Body Work .

– Unscrew fixing screws for radiator bearing on right and left ⇒ page 93 .

WARNING

Do not open the refrigerant circuit of the air conditioning system.

Caution

In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

Note

For the following work, a second mechanic is required to hold the radiator.

– Swing cooler towards the rear, remove the bearings on the sides, and unhook from the bottom bearings.

– Release the securing bolts -arrows- of the condenser.

– Remove cooler downwards.

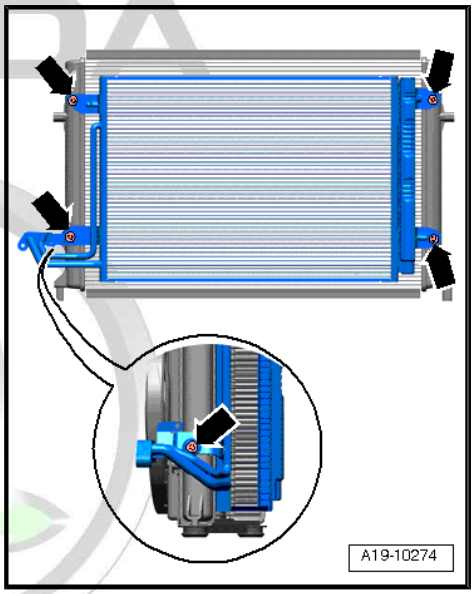
Install

Installation is carried out in the reverse sequence. However, pay attention to the following:

♦ Tightening torques: ⇒ page 93 .

– If a cooler is assembled, the old (drained) coolant may not be used.

– Top up coolant ⇒ page 98 .



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1.8 Removing and installing coolant pump

Note

- *The integrated gasket of the coolant pump must not be separated from the coolant pump.*
- *If damage and leak present, replace coolant pump with gasket completely.*

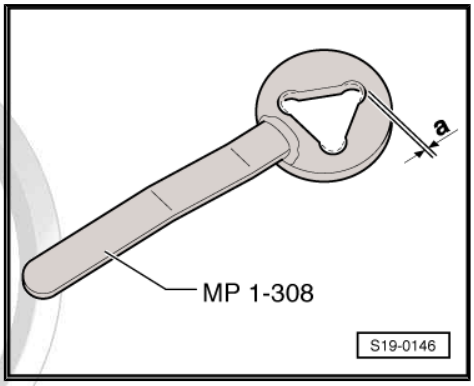
Special tools and workshop equipment required

- Wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590) -

Change wrench for the water pump and power-assisted steering - MP 1-308 -

– Because of modified fixing screws for the belt pulley of the coolant pump, the three curvatures must be filed open:

-a- at least 1 mm



Removing

– Drain coolant ⇒ page 98 .

– Remove the front right wheelhouse liner ⇒ Rep. gr. 66 ; Body Work .

– Remove V-ribbed belt ⇒ page 22 .

– Remove belt pulley from the coolant pump.

To do so, use the adapted wrench for the water pump and power-assisted steering - MP 1-308- .

– Release screws of coolant pump.

– Remove the coolant pump from the cylinder block.

Install

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Installation is carried out in the reverse order. When installing, observe the following:

– Insert coolant pump in the cylinder block.

– Tighten fixing screws to 9 Nm.

– Tighten belt pulley of the coolant pump to 20 Nm.

– Install the V-ribbed belt ⇒ page 22 .

– Install the front right wheelhouse liner ⇒ Rep. gr. 66 ; Body Work .

– Top up coolant ⇒ page 98 .

2 Checking the coolant system for leak tightness

2.1 Inspecting coolant system with cooling system testing device - V.A.G 1274- for tightness

Special tools and workshop equipment required

- Cooling system testing device , e.g. -V.A.G 1274-
- Adapter for cooling system testing device , e.g. -V.A.G 1274/8-
- Adapter for cooling system testing device , e.g. -V.A.G 1274/9-

Test condition

- Engine must be warm.

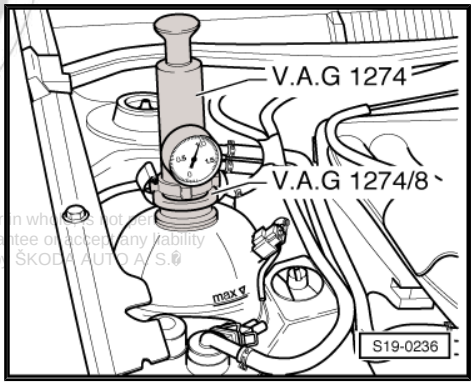
Test sequence

> **WARNING**
>
> *Hot steam may escape when the compensation bottle is opened.*
>
> - *Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.*
> - *Cover the cap with a cloth and open carefully.*

– Open compensation bottle.

– Position the cooling system testing device - V.A.G 1274- with adapter - V.A.G 1274/8- on the coolant expansion reservoir.

– Using the hand pump of the testing device generate an over-pressure of approx. 0.1 MPa (1 bar).



If the pressure drops:

– Search position of the leak and repair fault.

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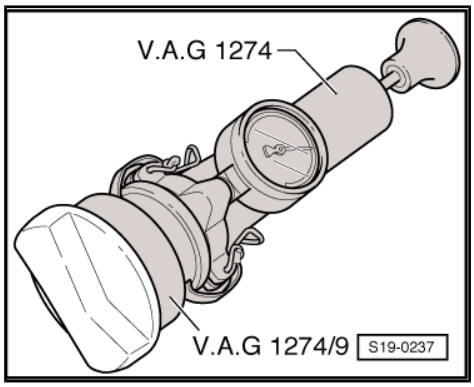
Testing the pressure relief valve in the cap

– Position the cooling system testing device - V.A.G 1274- with adapter - V.A.G 1274/9- on the cap.

– Operate the handpump.

- The pressure relief valve should open at a pressure of 0.14 ... 0.16 MPa (1.4 ... 1.6 bar).



If the pressure relief valve opens too early or too late

– Replace cap.

2.2 Inspecting coolant system with cooling system testing device - V.A.G 1274 B- for tightness

Special tools and workshop equipment required

- Cooling system testing device , e.g. -V.A.G 1274 B-
- Adapter for cooling system testing device , e.g. -V.A.G 1274/8-
- Adapter for cooling system testing device , e.g. -V.A.G 1274/9-

Test condition

- Engine must be warm.

Test sequence

WARNING

Hot steam may escape when the compensation bottle is opened.

- *Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.*
- *Cover the cap with a cloth and open carefully.*

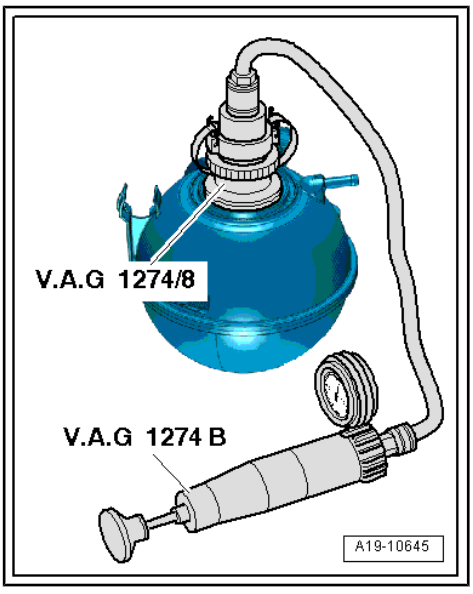
– Open compensation bottle.

– Screw the adapter for cooling system testing device - V.A.G 1274/8- into the coolant expansion bottle.

– Clamp the connecting piece - V.A.G 1274 B/1- in the adapter for cooling system testing device - V.A.G 1274/8- .

– Connect the connecting piece - V.A.G 1274 B/1- via the delivered connecting hose to the cooling system testing device - V.A.G 1274 B- .

– Using the hand pump of the testing device generate an overpressure of approx. 0.1 MPa (1 bar).



WARNING

Risk of scalding!

- *Before the cooling system testing device - V.A.G 1274 B- is separated from the connecting hose or the connecting piece - V.A.G 1274 B/1- , the existing pressure must absolutely be released.*
- *For this step, press the pressure relief valve on the cooling system testing device - V.A.G 1274 B- and hold it pressed until the pressure gauge indicates the value »0«.*

If the pressure drops:

– Search position of the leak and repair fault.

Testing the pressure relief valve in the cap

– Screw the screw cap into the adapter for cooling system testing device - V.A.G 1274/9- .

– Clamp the connecting piece - V.A.G 1274 B/1- in the adapter for cooling system testing device - V.A.G 1274/9- .

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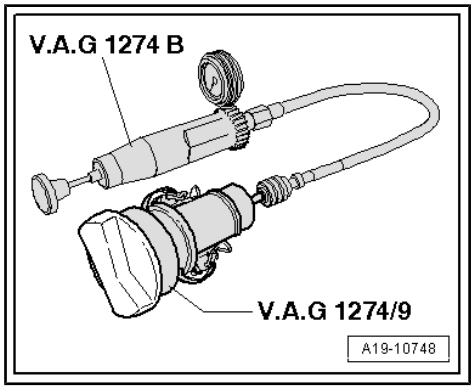
– Connect the connecting piece - V.A.G 1274 B/1- via the delivered connecting hose to the cooling system testing device - V.A.G 1274 B- .

– Operate the handpump.

• The pressure relief valve should open at a pressure of 0.14 ... 0.16 MPa (1.4 ... 1.6 bar).

If the pressure relief valve opens too early or too late

– Replace cap.



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20 – Fuel supply system

1 Removing and installing parts of the fuel supply system

Note

- *Fuel hoses at the engine must only be secured with spring-type clips. The use of clamp-type or screw-type clips is not allowed.*
- *Use pliers for spring strap clips to fit the spring strap clips.*
- *Fuel lines are secured with quick-release couplings ⇒ page 116 .*

Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .

Accelerator mechanism ⇒ page 129 .

Activated charcoal filter ⇒ page 131 .

1.1 Fuel tank with component parts - Summary of components

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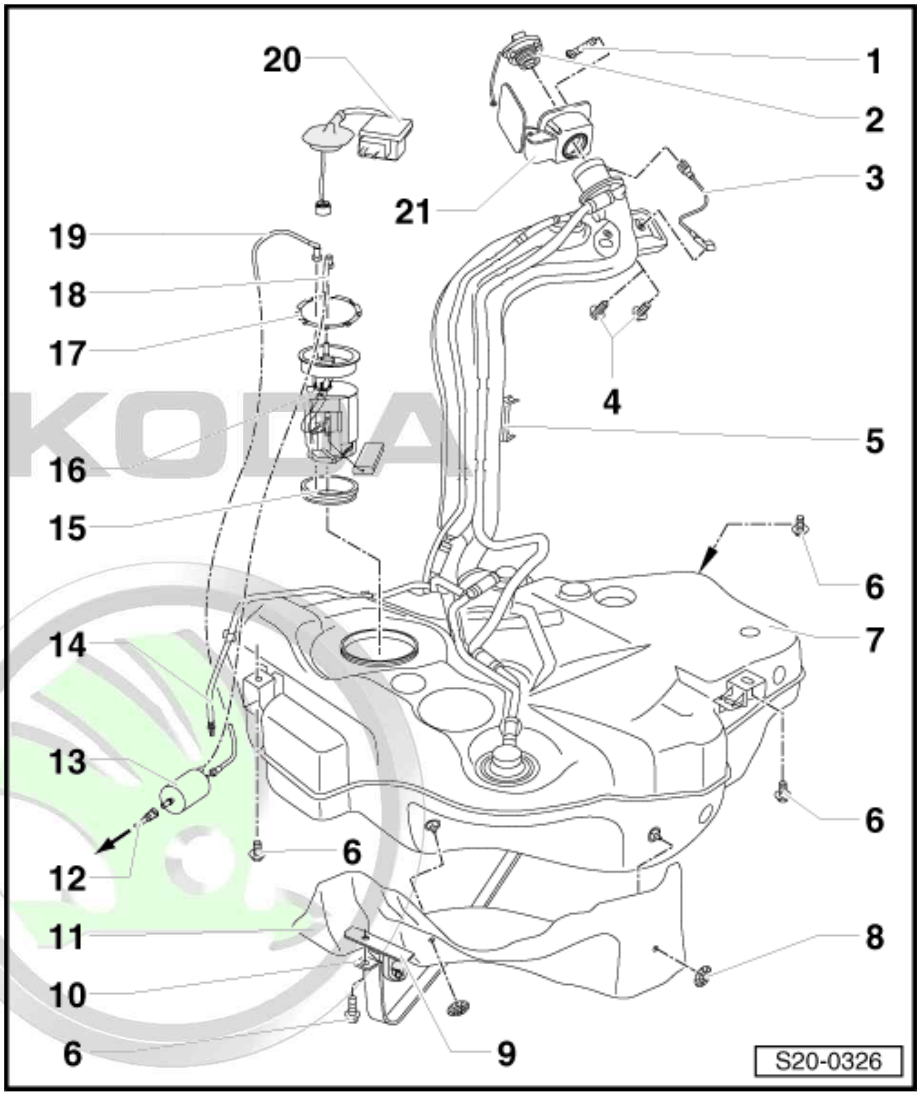

1 - Mounting part

2 - Screw cap

- ❑ replace if damaged

3 - Earth connection

- ❑ check for firm seating

4 - 11 Nm

5 - Support

6 - 25 Nm

- ❑ replace

7 - Fuel tank

- ❑ removing and installing ⇒ page 111

8 - Circlip

9 - Unbolt bracket for exhaust pipe

10 - Tensioning strap

- ❑ pay attention to correct installation position

11 - Heat shield

12 - Feed line

- ❑ to high pressure pump
- ❑ check for firm seating
- ❑ Separate ⇒ page 116

13 - Fuel filter

- ❑ Summary of components ⇒ page 109

14 - Vent line

- ❑ to the activated charcoal filter system
- ❑ clipped in place on the side of the fuel tank
- ❑ check for firm seating
- ❑ Separate ⇒ page 116

15 - Sealing ring

- ❑ replace
- ❑ to be inserted dry into the opening of the fuel tank
- ❑ only moisten the inner seal of the flange with fuel for fitting purposes

16 - Fuel pump

- ❑ removing and installing ⇒ page 114
- ❑ Check fuel delivery unit ⇒ page 121
- ❑ note the correct installation position in the fuel tank ⇒ page 115
- ❑ with sender for fuel gauge display - G -
- ❑ Removing and installing fuel gauge sender - G- ⇒ page 116 .
- ❑ Clean strainer if dirty

17 - Lock ring, 110 Nm

- ❑ check for firm seating
- ❑ use wrench - T30101- for removing and installing

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18 - Feed line

- ❑ black
- ❑ clipped in place on the side of the fuel tank
- ❑ check for firm seating
- ❑ Separate ⇒ page 116

19 - Return-flow line

- ❑ Blue
- ❑ clipped in place on the side of the fuel tank
- ❑ check for firm seating
- ❑ Separate ⇒ page 116

20 - Fuel pump control unit - J538 -

- ❑ after replacing, adapt the engine control unit - J623 - to the fuel pump control unit - J538- ⇒ Vehicle diagnostic tester

21 - Fuel tank lid unit

- ❑ with rubber bowl
- ❑ Removing and installing ⇒ Rep. gr. 55 ; Body Work

1.2 Fuel filter - Summary of components

1 - Fuel filter

- ❑ with installed pressure limiting valve for fuel return-flow line

  Opening pressure: 0.60…0.68 MPa (6.0… 6.8 bar)
- ❑ do not interchange connections
- ❑ Fitting position ⇒ page 110

2 - Fuel feed line

- ❑ black
- ❑ from fuel tank
- ❑ Separate ⇒ page 116

3 - Fuel return-flow line

- ❑ Blue
- ❑ to fuel tank
- ❑ Separate ⇒ page 116

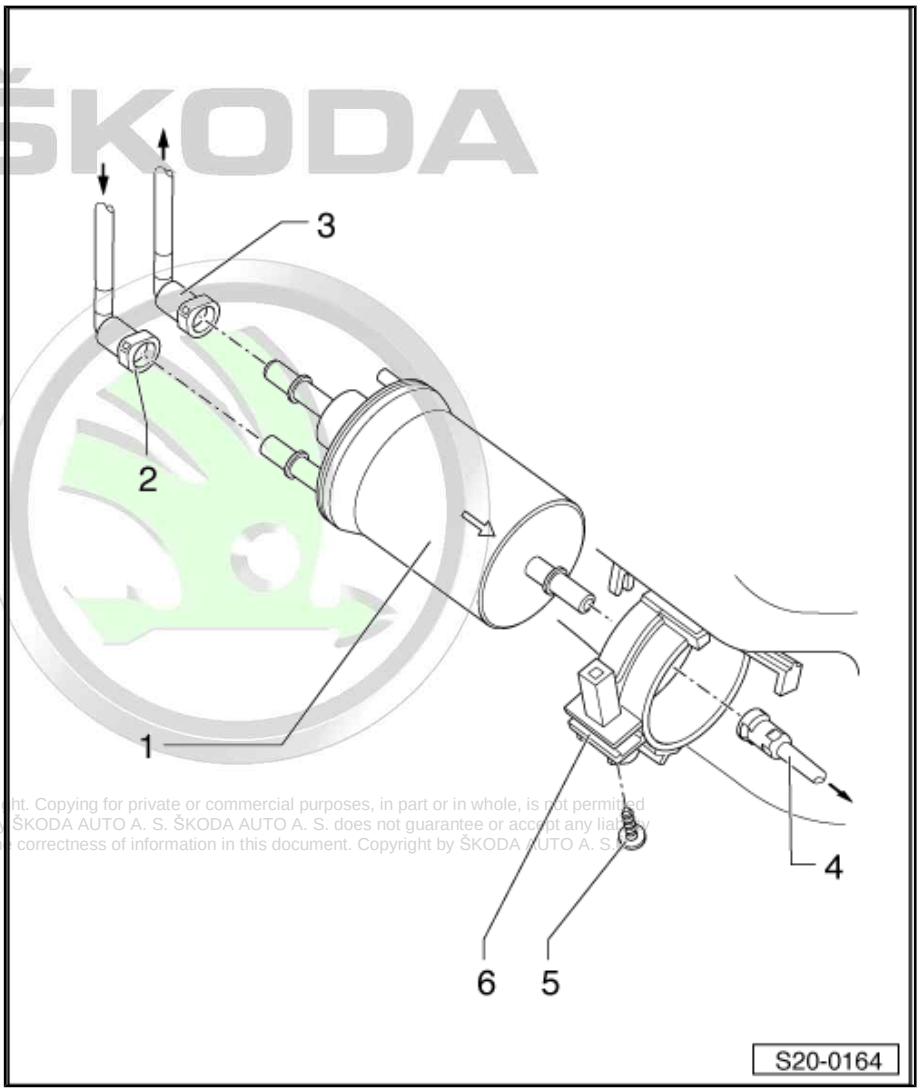
4 - Fuel feed line

- ❑ black
- ❑ to the engine
- ❑ Separate ⇒ page 116

5 - 3 Nm

6 - Support

- ❑ for fuel filter
- ❑ clipped in place on fuel tank



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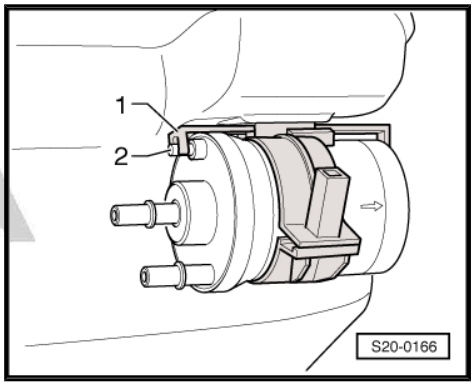
Fitting position of the fuel filter

The pin -2- at the filter housing must engage in the recess -1- of the bracket.

The direction of flow is marked by arrows.



1.3 Extract fuel from the fuel tank

Special tools and workshop equipment required

- Hose adapter , e.g. -V.A.G 1318/16 -
- Adapter , e.g. -V.A.G 1318/17A-
- Measuring tool set , e.g. -V.A.G 1594 C-
- Battery
- Fuel tank

Note

- *If the fuel pump is defective, suction off fuel using a fuel suction device , e.g. -VAS 5190- .*
- *Observe the safety instructions before starting fitting work ⇒ page 2 .*
- *Observe rules for cleanliness ⇒ page 4 .*

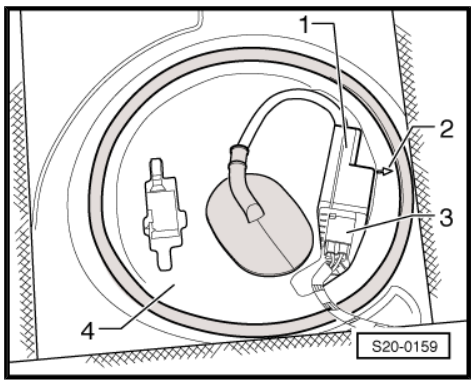
Work procedure

– Switch off ignition and all electrical loads, and pull out ignition key.

– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .

– Unclip cover -4- with fuel pump control unit - J538- -1-.

The arrow -2- on the cover points in direction of travel.



Note

For vehicles with auxiliary heating, the plug connection for the dosing pump - V54- must also be separated.

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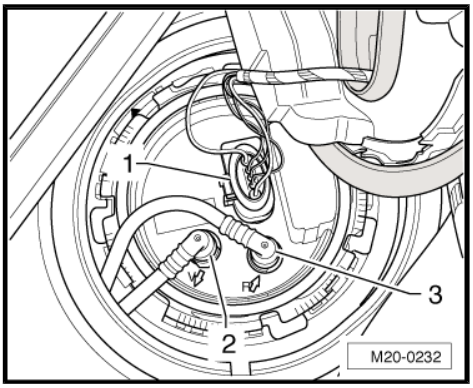
– Disconnect the 5-pin plug -1- and the black feed line -2-.

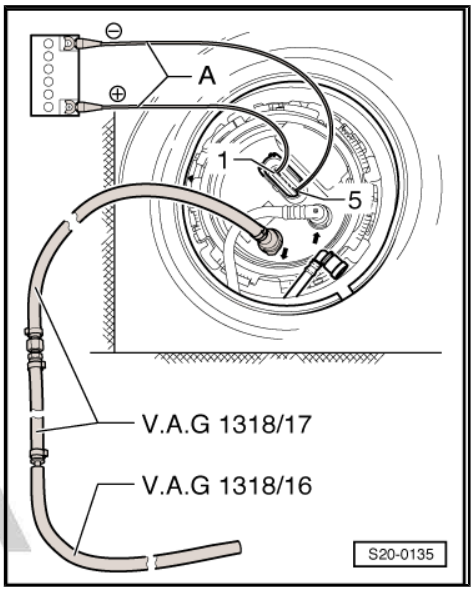


– Connect the adapter -V.A.G 1318/16- with the adapter -V.A.G 1318/17A- and fit this “drain pipe” thus prepared onto the feed support of the fuel delivery unit.
– Hold the “drain pipe” in a suitable fuel tank.
– Connect the battery and the contacts of the fuel pump with adapter cables -A- from the adapter cable set - V.A.G 1594/ C- as follows:

  Battery positive terminal (+) to contact -1- of the fuel pump.

  Battery negative terminal (-) to contact -5- of fuel pump.

The fuel pump runs and suctions off fuel.



WARNING

In order to prevent an overflow of fuel in case of a too small fuel tank, the fuel pump must not run unattended.

1.4 Removing and installing the fuel tank

Special tools and workshop equipment required

♦ Engine and gearbox jack . e.g. -V.A.G 1383 A-

Removing

• The fuel tank must not be more than $^1/_4$ full.
• Ignition and all electrical components are switched off and the ignition key is withdrawn.

Note

♦ *Where necessary, empty the fuel tank ⇒ page 110 .*
♦ *Observe the safety instructions before starting fitting work ⇒ page 2 .*
♦ *Observe rules for cleanliness ⇒ page 4 .*

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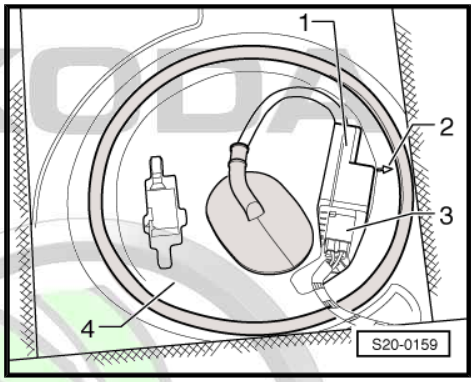
– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .

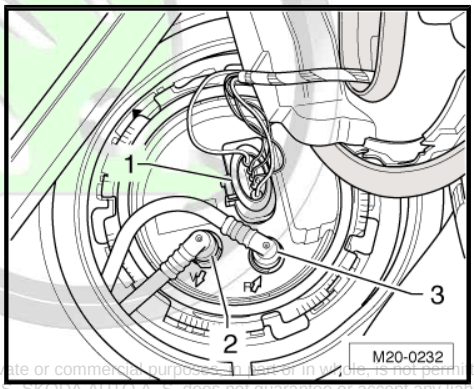
– Unclip cover -4- with fuel pump control unit - J538- -1-.



Note

For vehicles with auxiliary heating, the plug connection for the dosing pump - V54- must also be separated.

– Unplug the 5-pin plug -1- from the fuel pump.
– Clean area around fuel filler neck.
– Unscrew right rear wheel.
– Remove the rear right wheelhouse liner ⇒ Rep. gr. 66 ; Body Work .



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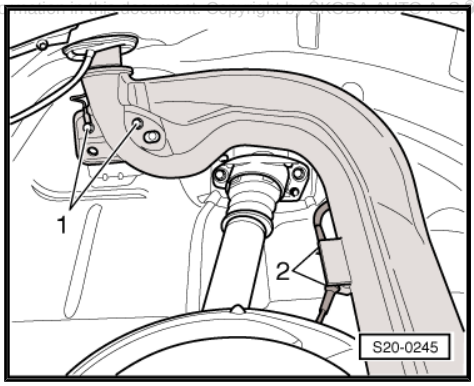
– Unscrew screws -1- for filler neck on the body.
– Unclip the electrical cable from the bracket -2- at the top and bottom of the filler neck.

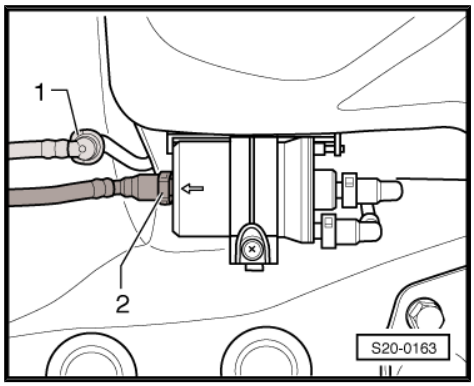


– Disconnect vent line -1- (white) and fuel feed line -2- (black) at the connection point ⇒ page 116 .

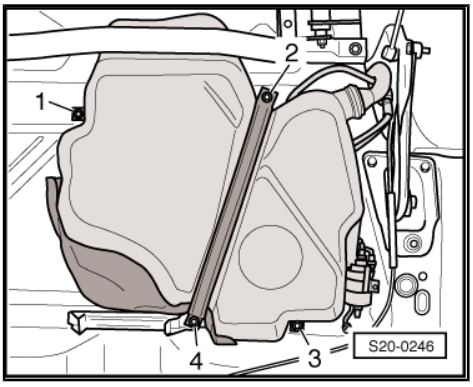
Note

For vehicles with auxiliary heating, the fuel line for the dosing pump - V54- ⇒ page 116 must also be disconnected.

– Remove the middle part of the exhaust system. If necessary the middle and rear part of the exhaust system must be separated first ⇒ page 163 .



– Release fixing screws -2- and -4- and remove the tensioning strap.
– Support the fuel tank using the engine and gearbox jack - V.A.G 1383 A- .
– Release fixing screws -1- and -3-.
– Slightly lower the fuel tank.

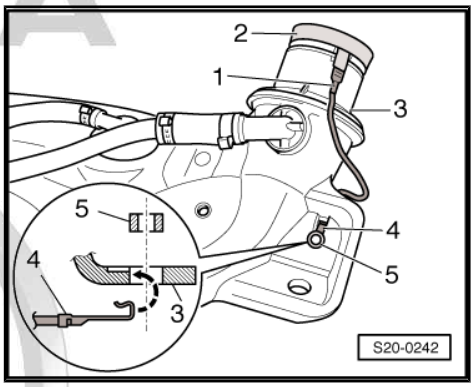


Note

The filler neck must be "extracted" between body and rear axle. Lift fuel tank down from the engine and gearbox jack - V.A.G 1383 A- with a 2nd mechanic.

Install

– Check both earth connections for corrosion, if necessary remove corrosion.
– Check fitting position of the earth lead -1-.



• The plug -1- on the metal plate ring -2- must be placed on firmly.
• The contact tab -4- must be hung on the fuel tank -3- and secured with the spacer bush -5-.
– Guide the filler neck between rear axle and structure with the assistance of a 2nd mechanic. Then position the fuel tank onto the engine/gearbox jack - V.A.G 1383 A- .

Further installation occurs in reverse order. Pay attention to the following:

♦ Lay the vent and fuel lines without any kinks.
♦ Do not mix-up the feed line and the return-flow line (the return-flow line is blue, the feed line is black).
♦ Make sure the line connections and the 5-pin plug fit tightly.
♦ Check earth connection of fuel tank/body at filler neck.
♦ After installing the fuel tank, check whether the lines are also clipped in place on the fuel tank.
♦ If the fuel delivery unit is replaced, the engine control unit must be adapted to the fuel pump on vehicles with the fuel pressure sender for low-pressure - G410 - (⇒ page 136 , -Position 4-) ⇒ Vehicle diagnostic tester. On vehicles with the fuel pressure sender for low-pressure - G410- adaptation takes place automatically during the journey.

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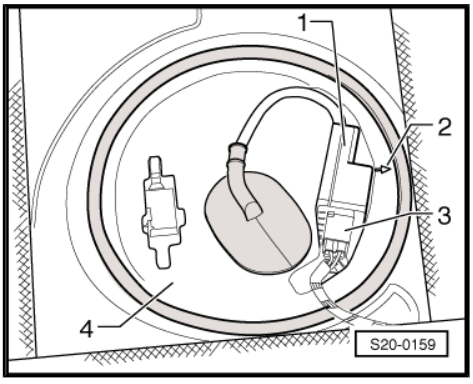
– Clip on cover -4- with fuel pump control unit - J538- -1-.

The arrow -2- on the cover points in direction of travel.



1.5 Removing and installing fuel delivery unit

Special tools and workshop equipment required

- Key - T30101 (3087)-

Removing

- The fuel tank must not be more than $^3/_4$ full.

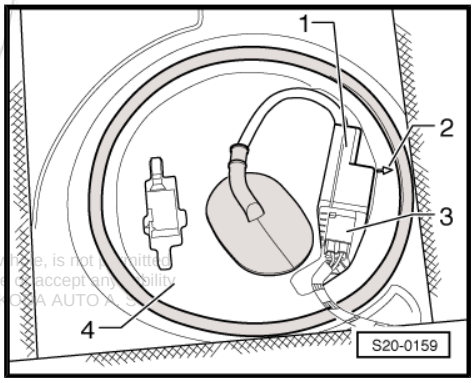
Note

- *If necessary, extract fuel from the fuel tank ⇒ page 110 .*
- *Observe the safety instructions before starting fitting work ⇒ page 2 .*
- *Observe rules for cleanliness ⇒ page 4 .*

– Switch off ignition and all electrical loads, and pull out ignition key.

– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .

– Unclip cover -4- with fuel pump control unit - J538- -1-.



Note

For vehicles with auxiliary heating, the plug connection for the dosing pump - V54- must also be separated.

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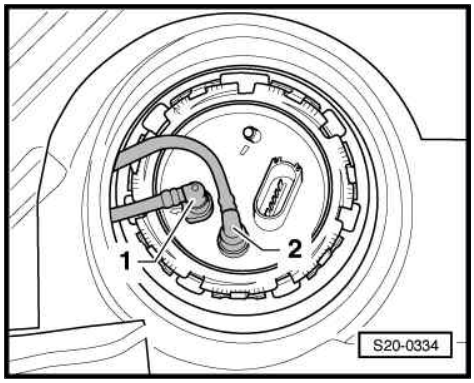
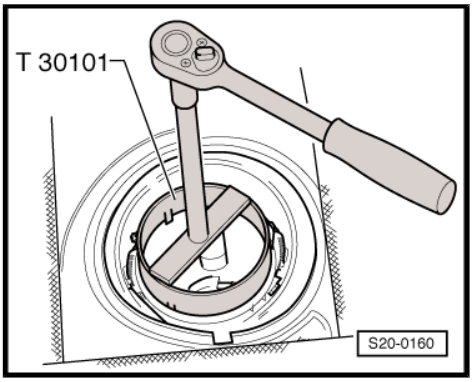
– Disconnect the 5-pin plug, the black feed line -1- and the blue return-flow line -2- ⇒ page 116 .



Note

For vehicles with auxiliary heating the suction line for the dosing pump - V54- must be pulled out additionally (open lower clamp).

– Open lock ring with the wrench - T30101- .



Note

- *Remove the fuel delivery unit from the fuel tank so that the cables and fuel hoses are not damaged and the float arm on the fuel gauge display sender - G- is not bent.*
- *You must empty the old delivery unit before disposing of it if you wish to replace the fuel delivery unit.*

– Pull the fuel delivery unit out of the opening of the fuel tank.

Install

Installation occurs in reverse order. Pay attention to the following:

– Insert the new dry gasket ring for the flange into the opening of the fuel tank and moisten only from the inside with fuel for installing the closing flange.

– Insert the fuel delivery unit into the fuel tank in such a way that the float arm of the sender for the fuel gauge display - G- is not bent.

– Press the closing flange downwards, install the lock ring and connect the fuel lines ⇒ page 116 .

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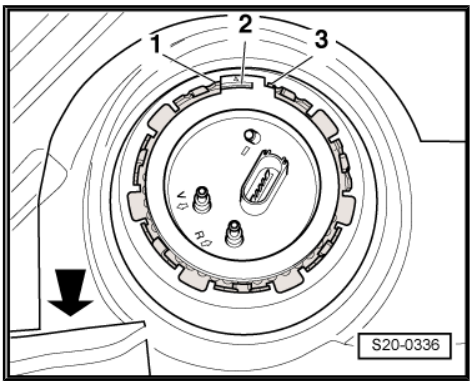
Fitting position of flange of fuel delivery unit

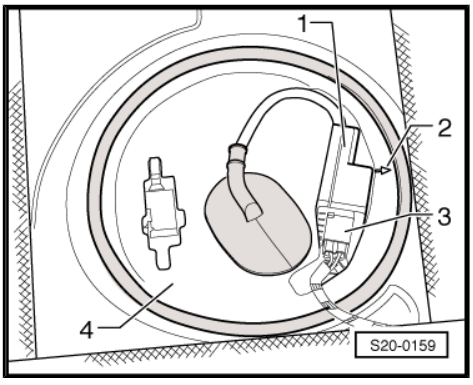


Note

- *Observe installation position of the fuel delivery unit flange. The peg -2- on the fuel delivery unit must be between the pegs -1- and -3-. The -arrow- shows the direction of travel.*
- *Tighten the lock ring to 110 Nm.*
- *Do not interchange the black feed line with the blue return-flow line (arrows on the flange of the fuel delivery unit).*
- *Make sure the line connections and the 5-pin plug fit tightly.*
- *After installing the fuel delivery unit, check whether the feed line and the return-flow line have also been clipped in place on the fuel tank.*
- *If the fuel delivery unit is replaced, the engine control unit must be adapted to the fuel pump on vehicles with the fuel pressure sender for low-pressure - G410 - (⇒ page 136 , -Position 4-) ⇒ Vehicle diagnostic tester. On vehicles with the fuel pressure sender for low-pressure - G410- adaptation takes place automatically during the journey.*

– Clip on cover -4- with fuel pump control unit - J538- -1-.

The arrow -2- on the cover points in direction of travel.

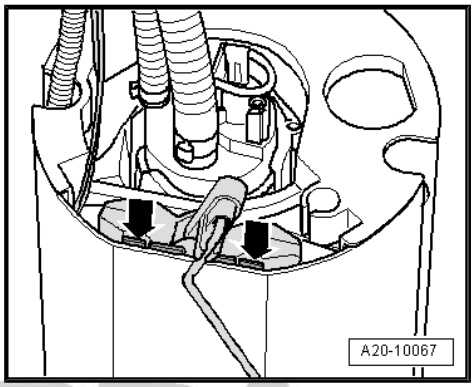


1.6 Removing and installing the sender for fuel gauge display - G-

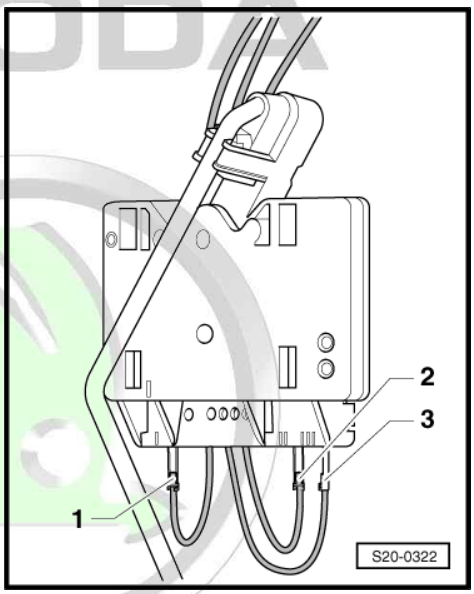
Removing

– Remove fuel delivery unit ⇒ page 114 .

– Unlock the securing tabs -arrows- using a screwdriver and pull out the transmitter for fuel gauge display - G- towards the top.



– Unlatch and disconnect the plug connection of the lines -1- (brown), -2- (blue) and -3- (black).



Install

– Connect the wiring and check correct installation of the plug.

– Insert the sender for fuel gauge display - G- in the guides at the fuel delivery unit and press downwards until it latches into position.

– Install fuel delivery unit ⇒ page 114 .

1.7 Separating push-on couplings

Special tools and workshop equipment required

◆ Lever - T10468-

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Assign quick couplings

Note

Quick couplings of fuel lines, vacuum and ventilation lines are colour marked. Either the colour point at the quick coupling or the release button has the corresponding colour.

Push-on coupling	Colour coding on the quick coupling
Fuel feed line	Black
Fuel return-flow line	Blue
Vent line	White, beige
Vacuum line	Green

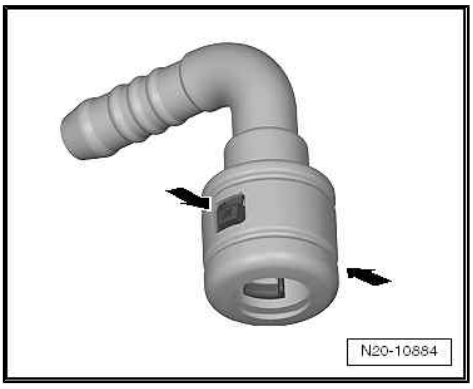
WARNING

Fuel supply line is pressurised! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Place cleaning cloths around the connection point before detaching hose connections. Reduce pressure by carefully removing the hose.

Variant 1

Quick coupling with release buttons -arrows- on right and left.

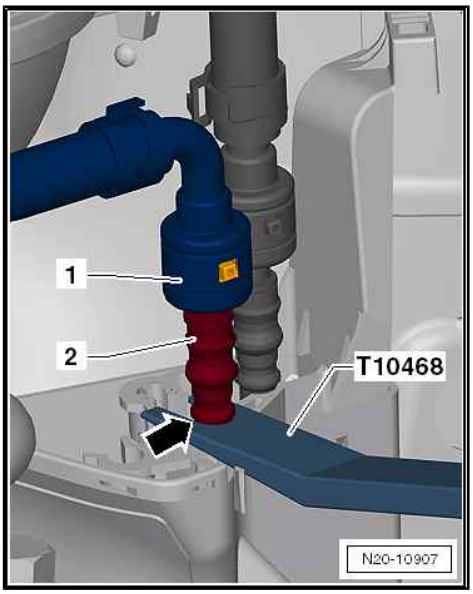
Opening



The separation point -1- in the engine compartment must be held in place.

– Insert the lever - T10468- between the heat shield and the stop -arrow- of the fuel line -2- and hold.

Continued for all separation points.



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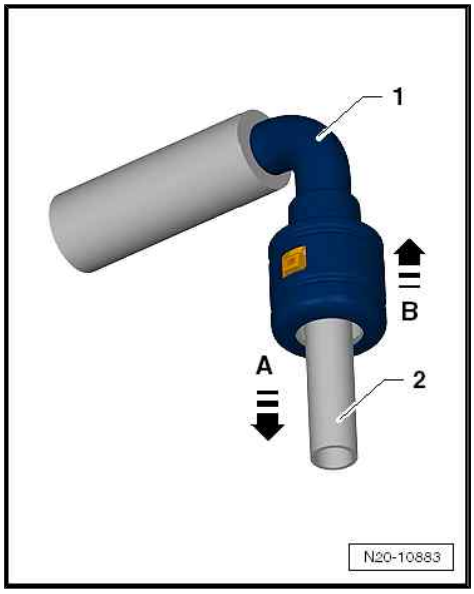
– Push push-on coupling -1- in -direction of arrow A-.
– Press release buttons and pull push-on coupling -1- off fuel line -2- in -direction of arrow B-.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

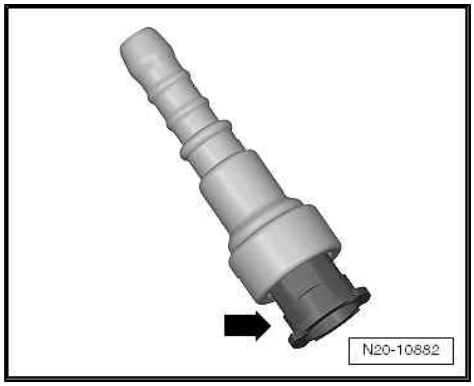
– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 2

Quick coupling with pull release -arrow-.

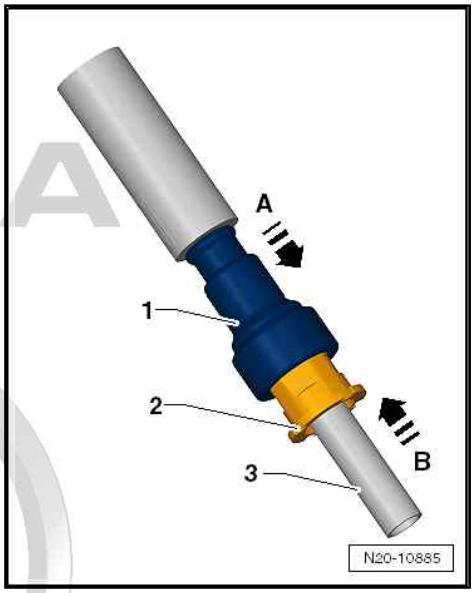
Opening



– Push push-on coupling -1- in -direction of arrow A-.
– Pull on the pull release -2- in -direction of arrow B-.
– Pull push-on coupling -1- off fuel line -3- in -direction of arrow B-.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 3

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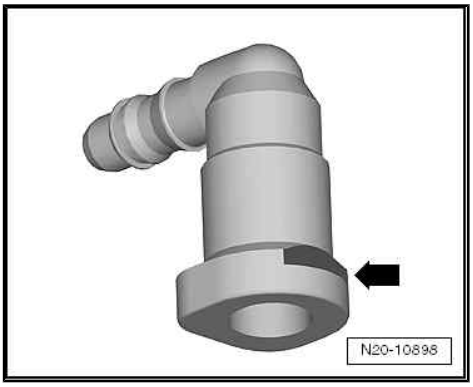
Quick coupling with front button -arrow-.

Opening

– Press release button -arrow- and pull push-on connectors off.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 4

Quick coupling with release buttons -arrows- on right and left.

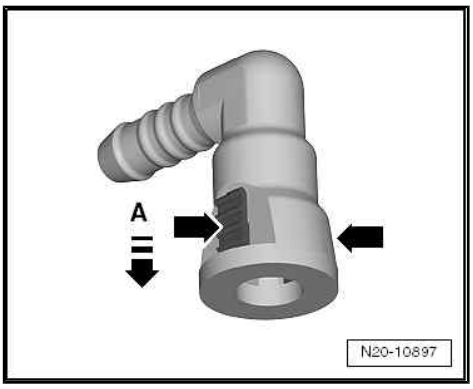
Opening

– Press push-on coupling in -direction of arrow A-.

– Press release buttons -arrow- and detach quick coupling.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 5

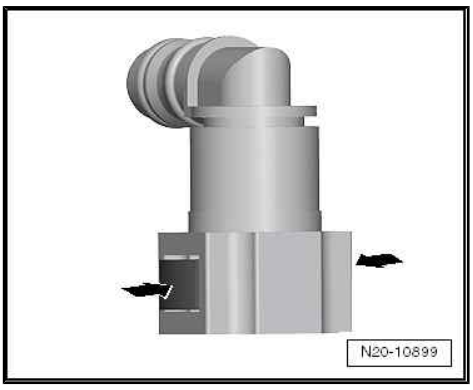
Quick coupling with release buttons -arrows- on right and left.

Opening

– Press release buttons -arrow- and detach quick coupling.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 6

Quick coupling with release buttons -arrows- on right and left.

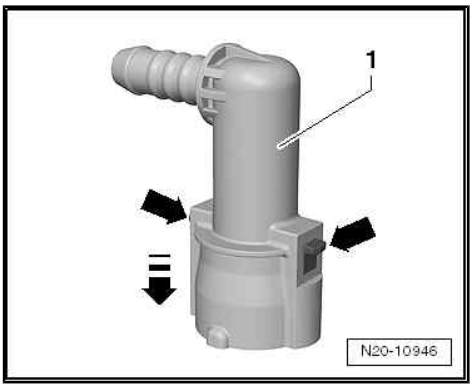
Opening

– Press push-on coupling -1- in -direction of arrow- and hold pressed.

– Press release buttons -arrow- and detach quick coupling.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

– Check the quick couplings for firm seating by pulling in the opposite direction!



Variant 7

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Quick coupling -1- with release buttons -2- right and left.

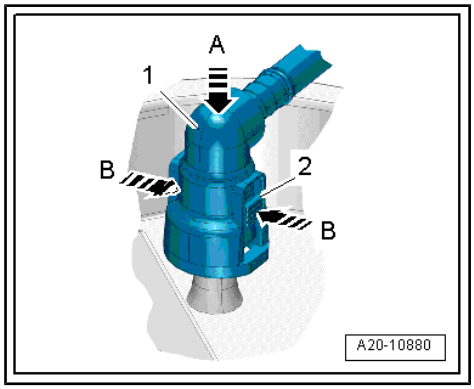
Opening

– Press push-on coupling -1- in -arrow direction A- and hold pressed.
– Press release buttons -2- in -arrow direction B- and remove quick coupling- 1-.

Pay attention to the assignment of the colours when installing ⇒ page 116 .

The quick coupling must be heard to click into place.

– Check the quick couplings for firm seating by pulling in the opposite direction!



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2 Testing parts of fuel supply system

2.1 Testing fuel pump

Special tools and workshop equipment required

- Key - T30101 (3087)-
- Pressure gauge , e.g. -V.A.G 1318 -
- Adapter , e.g. -V.A.G 1318/1-
- Adapter , e.g. -V.A.G 1318/11-
- Hose adapter , e.g. -V.A.G 1318/16-
- Adapter , e.g. -V.A.G 1318/17A-
- Double connection piece , e.g. -V.A.G 1318/23-
- Remote control , e.g. -V.A.G 1348/3A- with adapter cable , e.g. -V.A.G 1348/3-2 -
- Measuring tool set , e.g. -V.A.G 1594 C-
- Vehicle Diagnosis, Measurement and Information System - VAS/ODIS-
- Measuring glass

Note

The adapter set - V.A.G 1318/17A- replaces the adapter set - V.A.G 1318/17 - .

2.1.1 Checking function and voltage supply

Test conditions

- Battery voltage at least 11,5 V.
- Fuel pump fuse O.K. ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Fuel pump control unit - J538- OK.
- Fuel pressure sender for low-pressure - G410- (if present) OK

Test sequence

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Note

The function of the fuel pump is tested with the actuator diagnosis.

– Connect ⇒ Vehicle diagnostic tester.
– Switch on ignition.
– On the display, tap the buttons for “Vehicle self-diagnosis”, “01 - Engine electronics” and then “005 - Actuator diagnosis”.
– On the display press the right arrow button up to the actuator diagnosis of the fuel pump electronics.
- The fuel pump must now run slowly to the maximum speed.

Note

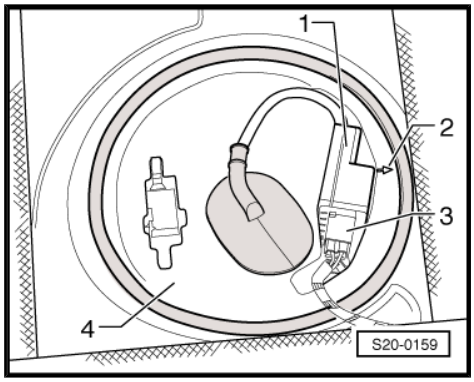
The fuel pump runs very quietly.

– Switch off ignition.

The fuel pump does not run:

– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .

– Disconnect connectors -3- from fuel pump control unit - J538- -1-.

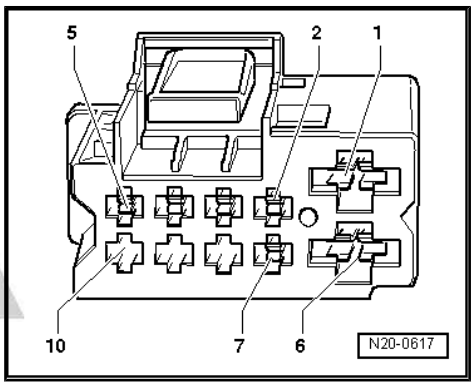


– Testing the voltage supply with the voltage tester - V.A.G 1527B- between contact -1- and -6-.

• The LED must light up.

The LED does not light up:

– Determine and remove open circuit in the wiring according to the current flow diagram ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



The LED lights up (power supply O.K.):

– Remove fuel delivery unit ⇒ page 114 .

– Check whether the electric wiring between the flange and fuel pump is connected.

If there is no open circuit in the wiring:

– Fuel pump defective, replace the fuel delivery unit ⇒ page 114 .

2.1.2 Checking fuel pressure

Note

♦ *Safety precautions when working on the fuel supply system ⇒ page 2 .*

♦ *Observe cleanliness requirements when working on the fuel system ⇒ page 4 .*

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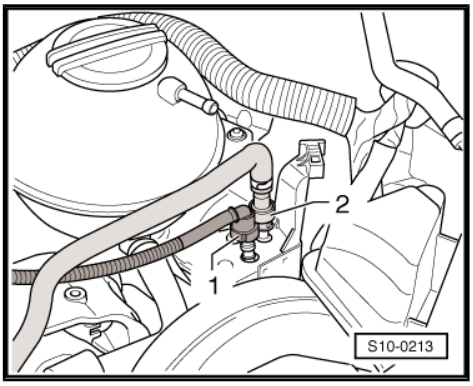
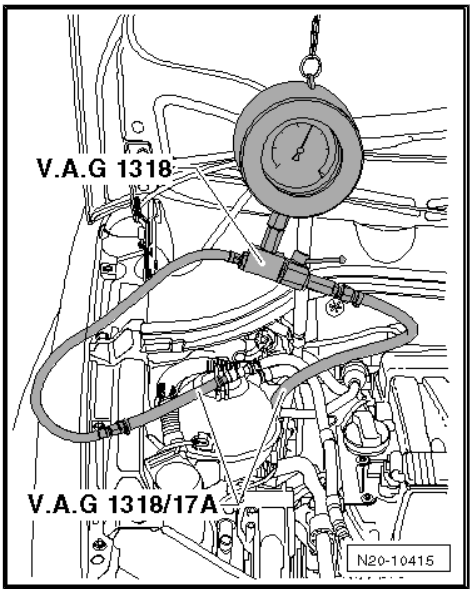
– Remove fuel feed line -2- ⇒ page 116 .



– Install the pressure gauge - V.A.G 1318 - with the adapter set - V.A.G 1318/17A- instead of the fuel feed line.
– Open shut-off cock of the pressure gauge.
– Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
– Read off fuel pressure on pressure gauge.
• Specified value: 0.35…0.7 MPa (3.5…7.0 bar)



If fuel line is o.k.:

– Test holding pressure ⇒ page 124 .

If the specified pressure is exceeded:

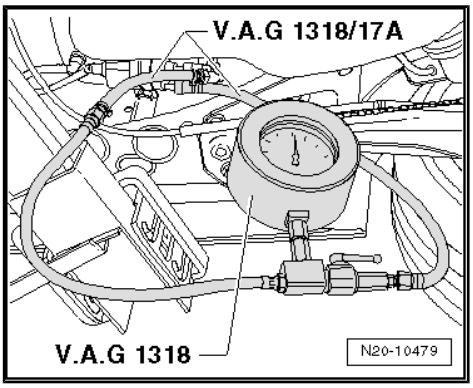
– Check the return line between the fuel filter and fuel pump for kinks and blockages.

If no fault is found:

– Pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the measurement is less than the specification:

– Check the fuel pressure before the fuel filter. To do so, connect the pressure gauge - V.A.G 1318- with the adapter - V.A.G 1318/17A- between the fuel filter and fuel feed line.
– Open shut-off cock of the pressure gauge. Lever points in direction of flow.
– Start engine and run in idle.



Caution

Only shut off the shut-off cock slowly. At a fuel pressure of 0.8 MPa (8 bar), the shut-off cock must be opened again immediately in order to prevent damage to the pressure gauge.

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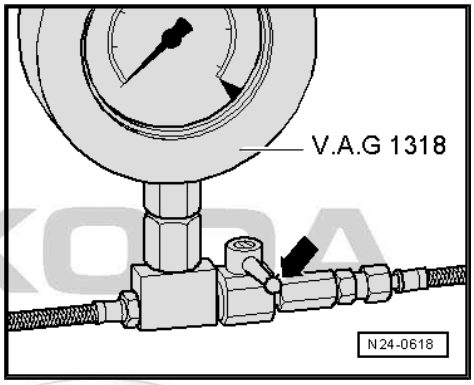
– Close the shut-off cock of the pressure gauge slowly. Lever is then at right angle to direction of flow -arrow-.

• The pressure must rise to at least 0.6 MPa (6.0 bar).

– If the 0.6 MPa (6.0 bar) is reached, immediately open the shut-off cock again!



If pressure has risen:

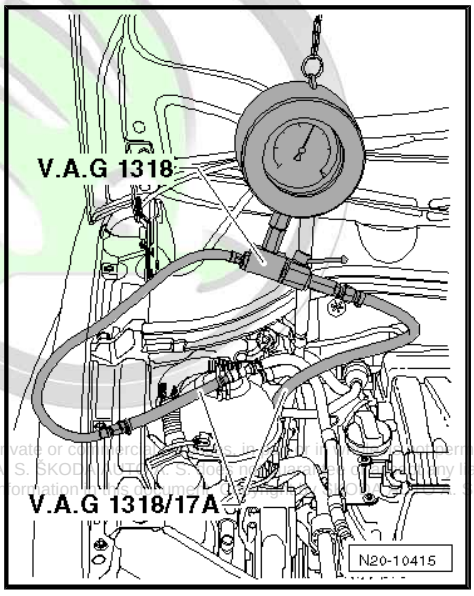
– Fuel pump O.K., pressure limiting valve in the fuel filter defective, replace the fuel filter.

If pressure does not rise:

– Fuel pump defective, replace fuel delivery unit ⇒ page 114 .

2.1.3 Testing holding pressure

• Fuel pressure O.K. and pressure gauge - V.A.G 1318- connected in the engine compartment ⇒ page 122 .



Note

♦ *Safety precautions when working on the fuel supply system ⇒ page 2 .*

♦ *Observe cleanliness requirements when working on the fuel system ⇒ page 4 .*

– Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.

– Read off fuel pressure on pressure gauge.

• Specified value: 0.35…0.7 MPa (3.5…7.0 bar)

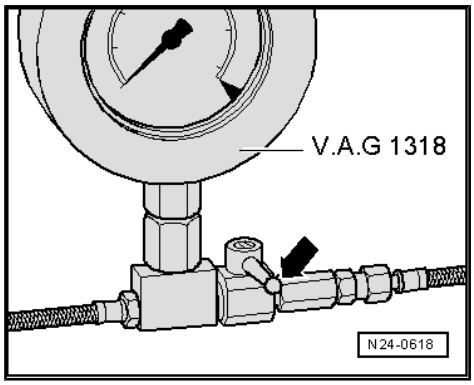
– Observe pressure drop at pressure gauge.

• The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure again drops:

– Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.

– Close the shut-off cock of the pressure gauge immediately. Lever is then at right angle to direction of flow -arrow-.



If the pressure again drops:

– Check the low-pressure line to the high pressure pump for tightness.

If no fault is found:

– Replace high pressure pump ⇒ page 150 .

If the pressure does not drop now:

– Check the fuel line to the fuel filter for tightness.

If the fuel line is not found to be faulty:

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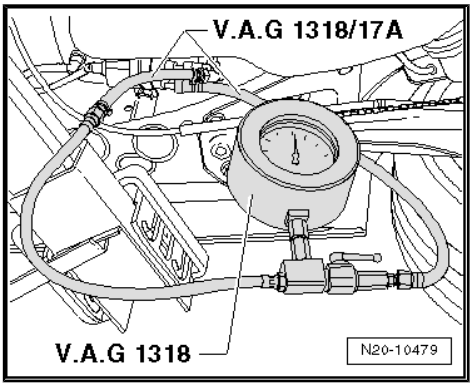
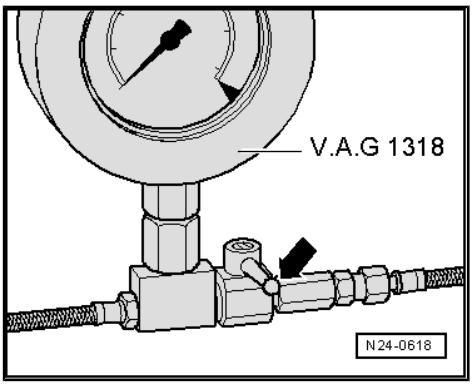
– Check the check valve in the fuel delivery unit. To do so, connect the pressure gauge - V.A.G 1318- with the adapter - V.A.G 1318/17A- between the fuel filter and fuel feed line.



– Open shut-off cock of the pressure gauge. Lever points in direction of flow.
– Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
– Read off fuel pressure on pressure gauge.

• Specified value: 0.35…0.7 MPa (3.5…7.0 bar)

– After the pressure has built up, close the shut-off cock of the pressure gauge immediately. Lever is then at right angle to direction of flow -arrow-.



– Observe pressure drop at pressure gauge.

• The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

– Non-return valve in the fuel pump faulty, replace fuel delivery unit ⇒ page 110 .

If the pressure does not drop:

– Pressure limiting valve in the fuel filter defective, replace the fuel filter.

2.1.4 Check fuel flow rate

Note

♦ *Safety precautions when working on the fuel supply system ⇒ page 2 .*

♦ *Observe cleanliness requirements when working on the fuel system ⇒ page 4 .*

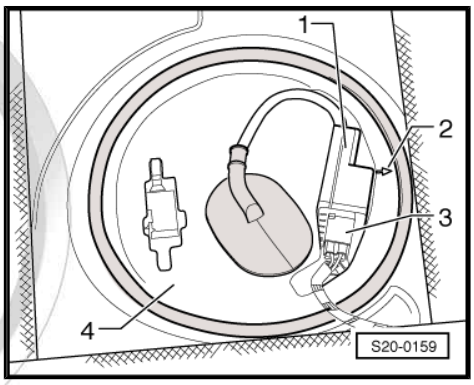
– Switch off ignition and all electrical loads, and pull out ignition key.
– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .
– Disconnect connectors -3- from fuel pump control unit - J538- -1-.

Vehicles with auxiliary heating.

– Unplug the 2-pin plug of the dosing pump - V54- .

Continued for all vehicles

– Remove timing belt guard -4-.



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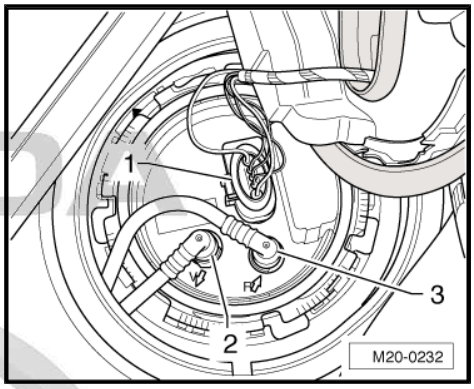
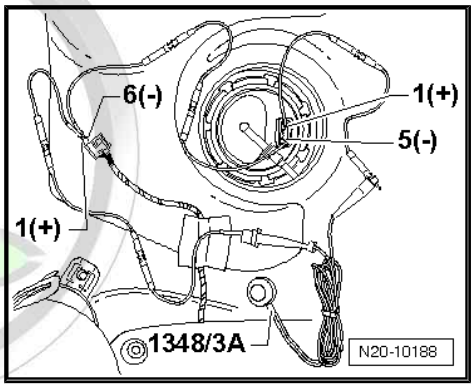
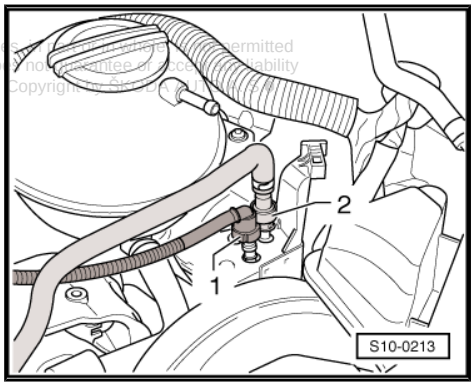
– Unplug connector -1-.



– Connect remote control - V.A.G 1348/3A - with auxiliary cables to contact -1(+)- of the fuel pump and contact -1(+)- of the 10-pin connector.
– Connect the contact -6(-)- of the 10-pin connector with the contact -5(-)- of the fuel pump with an auxiliary line from the Adapter set - V.A.G 1594 C- .
– Remove cap from the fuel filler neck.



– Remove fuel feed line -2- ⇒ page 116 .



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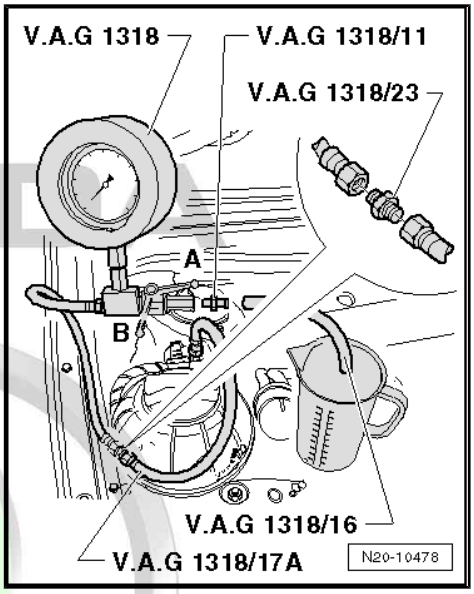
– Connect the pressure gauge - V.A.G 1318- with the double connection piece - V.A.G 1318/23- and the adapter - V.A.G 1318/17A- to the fuel feed line.

– Fit the hose adapter - V.A.G 1318/16- onto the adapter - V.A.G 1318/11- of the pressure gauge and hold it in a measuring vessel.

– Close the shut-off cock of the pressure gauge. The lever then points in the position -B-.



WARNING

Danger of liquid spraying out when opening the shut-off valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Hold the container in front of the free connection to the pressure gauge.

– Open shut-off cock of the pressure gauge.

  The lever then points in the direction of flow -A-.

– Operate remote control - V.A.G 1348/3A- . While doing so, slowly close the shut-off cock until the pressure gauge displays 0.4 MPa (4 bar) overpressure. No longer change the position of the shut-off cock and do not actuate the remote control.

– Empty measuring glass.

– The fuel flow rate of the fuel pump is dependent on the battery voltage. For this reason, connect the Multimeter - V.A.G 1715- with auxiliary lines from the Adapter set - V.A.G 1594 C- to the vehicle battery.

– Activate remote control for 30 seconds while measuring the battery voltage.

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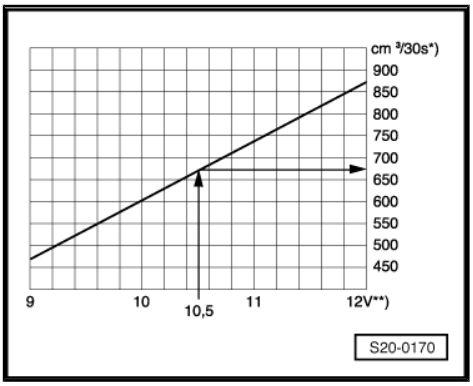
– Compare the fuel rate with the specified value.



*) Minimum flow rate in cm^3/30 s

**) Voltage at the fuel pump when engine is not running and pump is operating (approx. 2 volts less than battery voltage)

Read out examples:

During the test a voltage of 12.5 V was measured on the battery. As the voltage on the fuel delivery unit is approx. 2 V less than the battery voltage, a minimum flow rate of 675 cm^3/30 s is shown in the diagram.

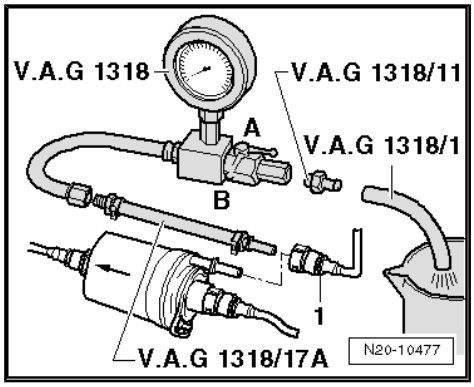
If the minimum fuel delivery volume is not reached:

– Check fuel feed line for possible restrictions (kinks) or blockages.

If the fuel line is O.K.:

– Check the fuel flow rate before the fuel filter.

– Disconnect fuel feed line -1- at fuel filter ⇒ page 116 .
– Connect pressure gauge - V.A.G 1318- with adapter - V.A.G 1318/17A- to the fuel feed line -1-.
– Repeat the fuel flow rate test analogously to the check in the engine compartment.



If the minimum flow rate is now reached:

– Replace fuel filter.

If the minimum flow rate is again not reached:

– Remove fuel delivery unit and inspect filter strainer for soiling.

  You can see the filter strainer in the bowl of the fuel delivery unit from the top.

If you have still not found any fault up to this stage:

– Replace fuel delivery unit.
– Connect all released fuel lines.

If the required fuel flow rate has been achieved, but a fault is still suspected in the fuel supply system (e.g. intermittent breakdown of the fuel supply):

– Check current consumption of fuel pump ⇒ page 128 .

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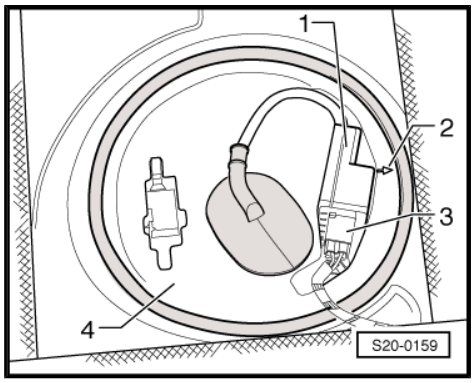
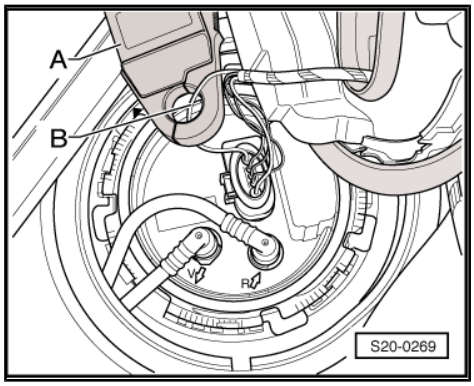
2.1.5 Check voltage consumption of the fuel pump

– Removing rear seat bench ⇒ Rep. gr. 72 ; Body Work .
– Unclip cover -4- with fuel pump control unit - J538- -1-.

  The arrow -2- on the cover points in direction of travel.



– Connect the current probe -A- ⇒ Vehicle diagnostic tester to the line -B- to contact 1 of the 5-pin connector.
– Start engine and run in idle.
– Measure voltage consumption of the fuel pump.



• Specified value: max. 9 amps

Note

If the fault in the fuel supply system is intermittent then tests can be undertaken during a test drive but then a second mechanic is required for this.

If the power consumption is exceeded:

– Fuel pump defective, replace fuel delivery unit.

3 Accelerator mechanism

3.1 Assembly overview - accelerator module

1 - Connector

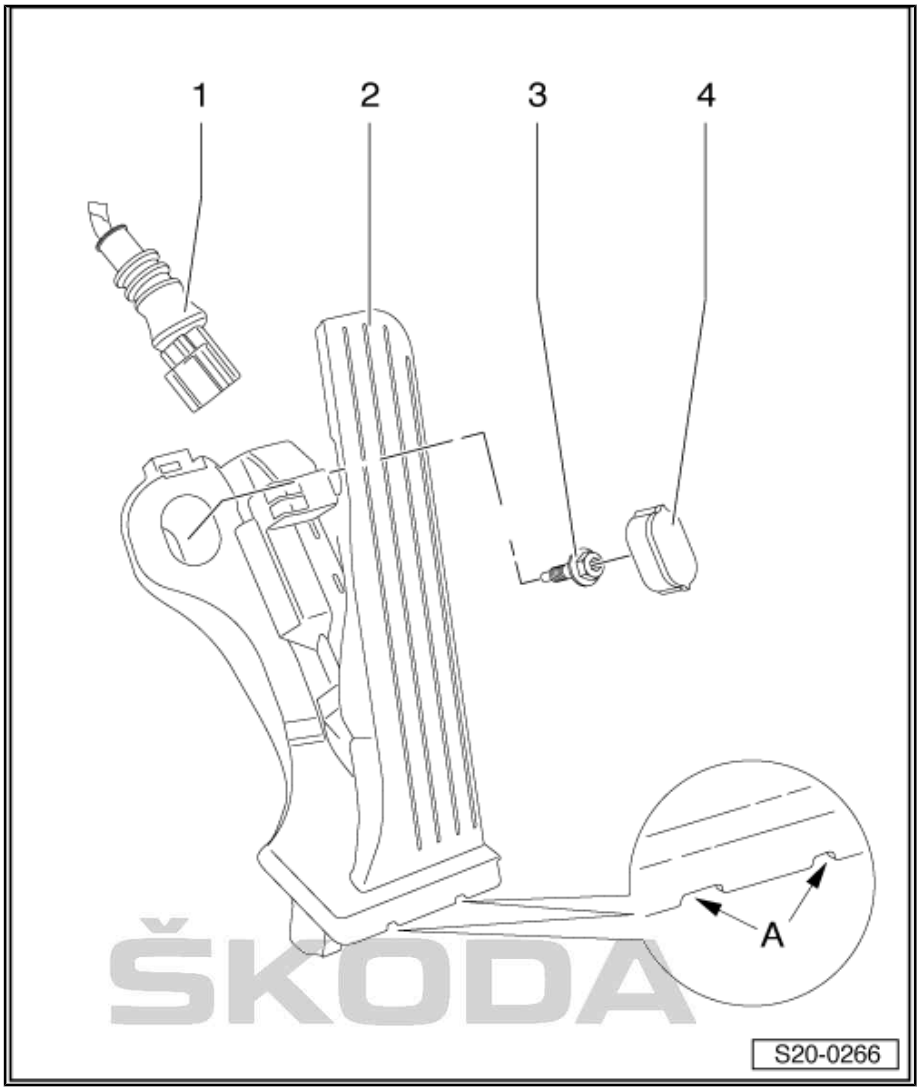
- ❑ Black, 6-pin.

2 - Accelerator pedal position sender - G79- with accelerator pedal position sender 2 - G185-

- ❑ not adjustable
- ❑ -A- are openings for the release tool
- ❑ removing and installing ⇒ page 129
- ❑ when replacing on vehicles with automatic gearbox, the engine control unit must be adapted ⇒ Vehicle diagnostic tester

3 - 10 Nm

4 - Cap



3.2 Removing and installing accelerator pedal module

Special tools and workshop equipment required

- ♦ Release tool - T10238- (for left-hand drive vehicle)
- ♦ Release tool - T10240- (for right-hand drive vehicle)

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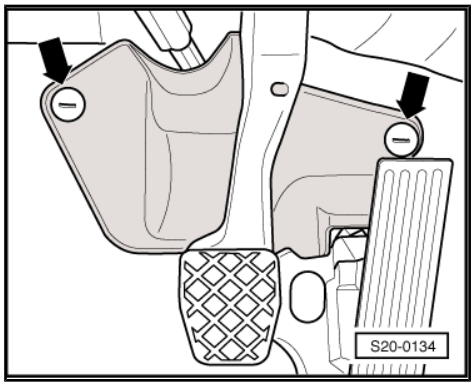
Removing

– Remove steering column trim panel -arrows-.

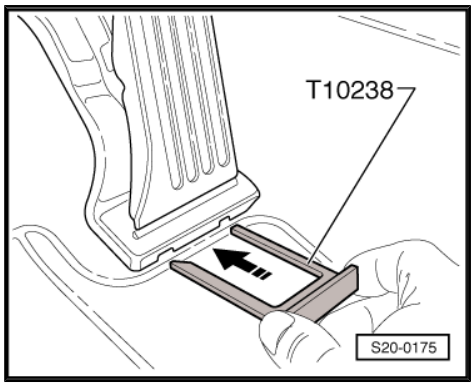
– Lever out the cap (⇒ page 121 , -Pos. 4-) with a screwdriver.

– Release holding down bolt (⇒ page 121 , -Position 3-).



– Push the release tool - T10238- (for right-hand drive vehicles release tool - T10240-) as shown up to the stop into the provided openings and remove the accelerator pedal module.

– Disconnect connector from accelerator pedal module. To do so press down securing element from plug.



Install

– Fit the connector -2- onto the accelerator pedal module -5-

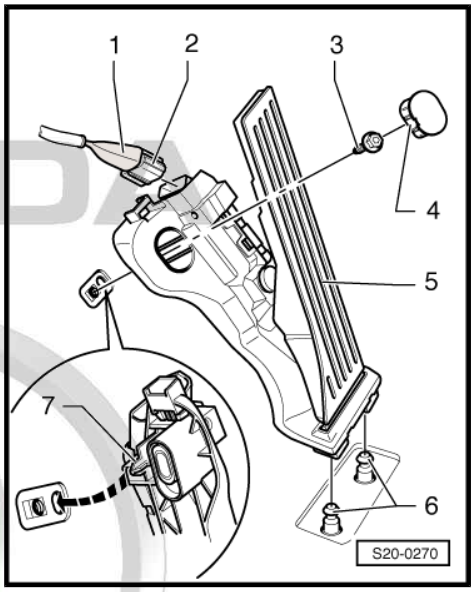
– Push accelerator pedal module onto the fixing bolts -6-.

– Insert the centering pin -7- into the hole in the underbody.

– Fasten accelerator pedal module with screw -3- (10 Nm) and fit on cap -4-.

– Re-install steering column trim panel.

– If the accelerator pedal module was replaced on vehicles with automatic gearbox, the engine control unit must be adapted ⇒ Vehicle diagnostic tester.



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4 Activated charcoal filter system

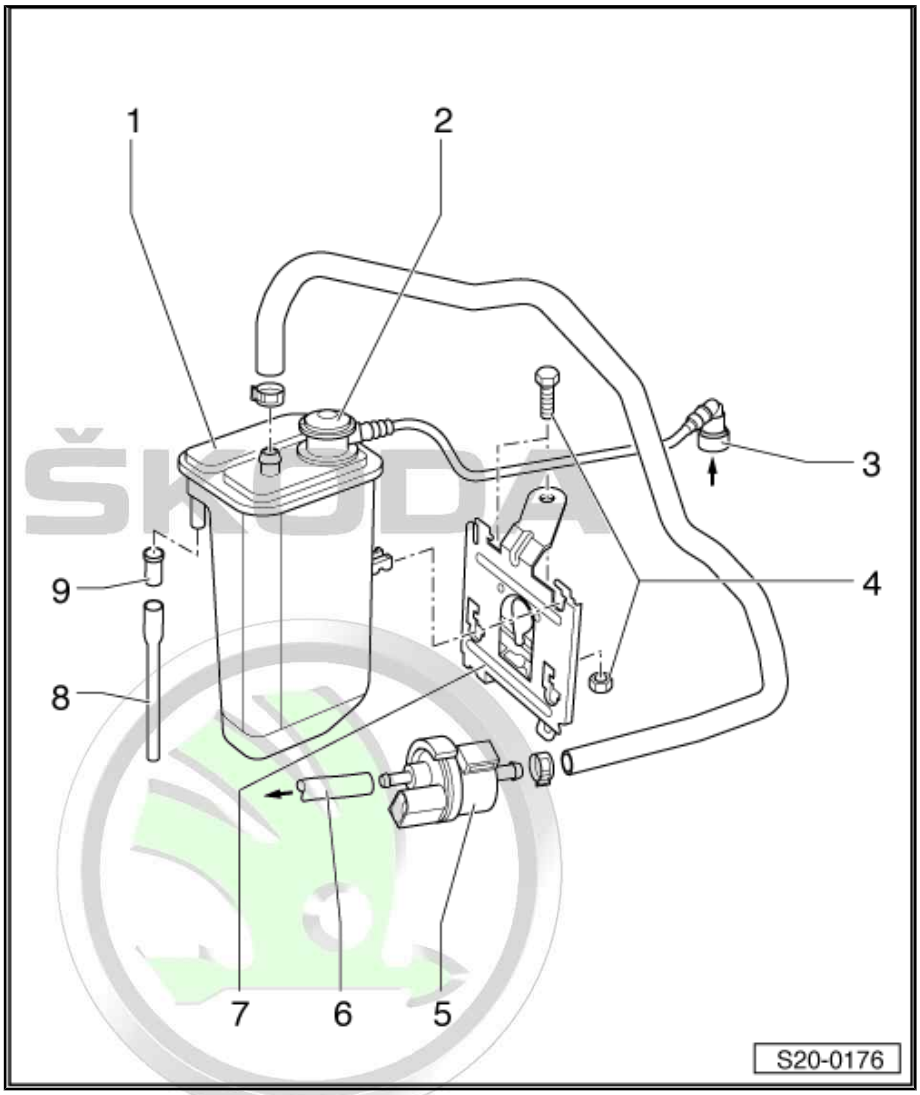
4.1 Assembly overview - activated charcoal filter system

Note

- *The hose connections are secured with spring strap clips or clamp-type clips.*
- *Renew clamp-type clips with spring-type clips.*
- *Use pliers for spring strap clips to fit the spring strap clips.*

Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .



1 - Activated charcoal filter

- ❑ Fitting location: in right of engine compartment
- ❑ if the catch peg is unlocked, the activated charcoal filter can be removed from the holder
- ❑ Checking the fuel tank venting ⇒ page 132

2 - Pressure holding valve with connection hose

3 - Vent line

- ❑ check for firm seating
- ❑ from fuel tank
- ❑ Separate ⇒ page 116

4 - 8 Nm

5 - Activated charcoal filter solenoid valve 1 - N80-

- ❑ When the ignition is switched off, the valve is closed
- ❑ When the engine has reached its operating temperature, the valve is actuated by the engine control unit (pulsed)

6 - Connecting hose

- ❑ To intake manifold
- ❑ check for firm seating

7 - Support

- ❑ for activated charcoal filter
- ❑ new version made of plastic

8 - Air admission hose

- ❑ up to 10.04

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9 - Grommet

❑ up to 10.04

4.2 Checking the fuel tank venting

Special tools and workshop equipment required

- Hand vacuum pump , e.g. -VAS 6213-
- Adapter set , e.g. - V.A.G 1318/17A-
- Adapter , e.g. -V.A.G 1318/20-1-

Note

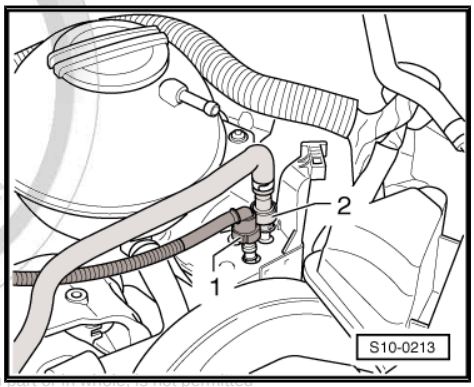
- *The adapter set - V.A.G 1318/17A- replaces the adapter set - V.A.G 1318/17 - .*
- *The figures shown in the description were not changed for this reason.*

Test condition

- The ignition must be switched off.

Test sequence

– Detach vent line -1- ⇒ page 116 .



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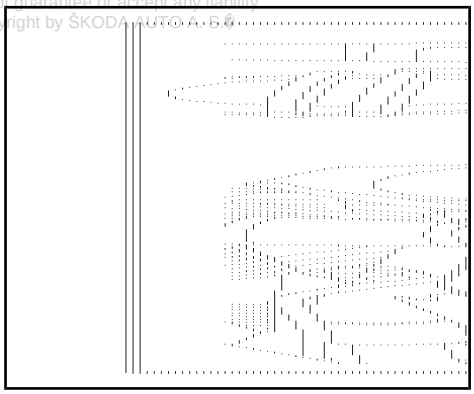
– Then connect the hand vacuum pump - VAS 6213- -1- on the vent line -2- as shown in the figure.



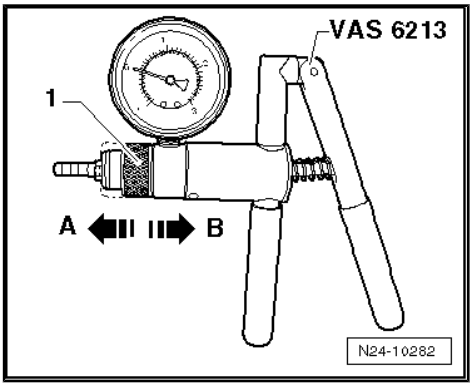
– Slide the shift ring -1- at the hand vacuum pump - VAS 6213- in -direction of arrow A- up to the stop.
– Operate hand vacuum pump - VAS 6213- several times.

• No vacuum should build up.

If a vacuum builds up.

– Check breather hose or air admission fitting on activated charcoal filter for soiling and clean if necessary.

If no vacuum builds up:

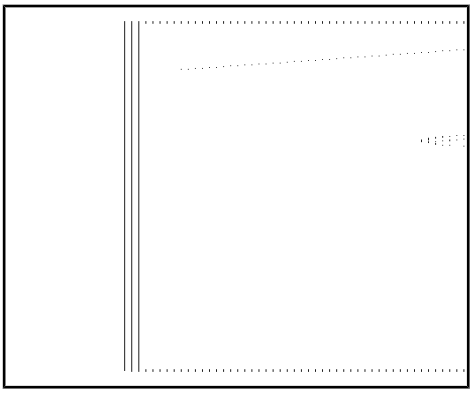


– Shut off breather hose or air admission fitting -arrow- and once again operate the vacuum pump several times.

• A vacuum should build up.

If no vacuum builds up:

– Replace activated charcoal filter.



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24 – Mixture preparation - injection

1 Injection system

General notes on the injection system ⇒ page 4

1.1 Installation location overview

The components A through I are not shown in the drawing.

1 - Pressure relief valve (PCV valve)

- ❑ on timing case ⇒ page 23

2 - Vacuum setting element for intake manifold flap

- ❑ on fuel distributor (lower part of intake manifold) ⇒ page 136

3 - Intake manifold pressure sender - G71- and intake air temperature sender - G42-

- ❑ on the intake manifold ⇒ page 136

4 - Fuel pressure sender for low-pressure - G410-

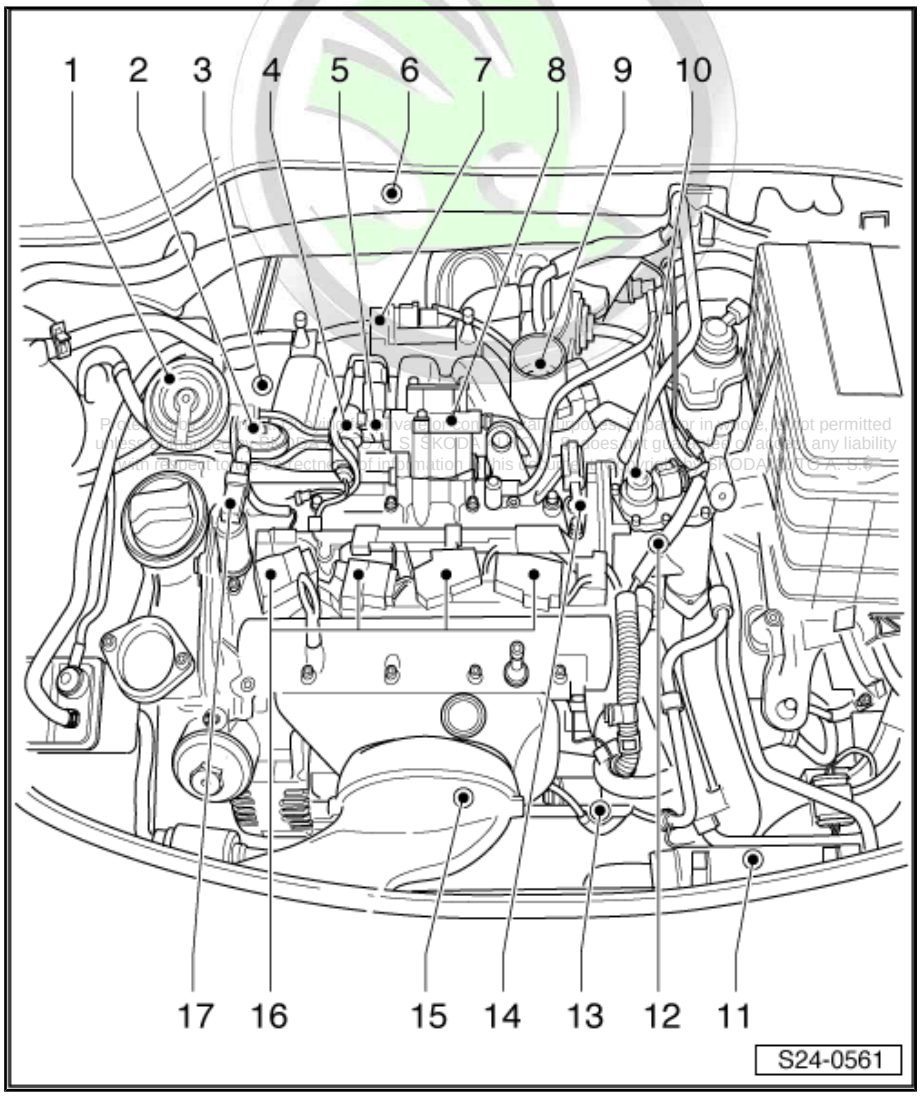
- ❑ mounted up to 05.05
- ❑ in the fuel feed line ⇒ page 136

5 - Control valve for fuel pressure - N276-

- ❑ to the fuel high pressure pump

6 - Motronic control unit - J220-

- ❑ with integrated sender for ambient pressure
- ❑ in plenum chamber
- ❑ removing and installing ⇒ page 154
- ❑ When replacing, clean the throttle valve control unit - J338- and adapt the engine control unit to



the throttle valve control unit

7 - Activated charcoal filter solenoid valve 1 - N80-

- on the intake manifold ⇒ page 136

8 - Fuel high pressure pump

- on camshaft housing
- removing and installing ⇒ page 150

9 - Throttle valve module - J338-

- with throttle valve drive for electronic power control - G186- , angle sensor 1 for throttle valve drive for electronic power control - G187- and angle sensor 2 for throttle valve drive for electronic power control - G188-
- on the intake manifold ⇒ page 136
- After replacement, adapt the engine control unit to the throttle valve control unit ⇒ Vehicle diagnostic tester.
- Cleaning the throttle flap control unit - J338- ⇒ page 149

10 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- to camshaft housing
- removing and installing ⇒ page 166

11 - Coolant temperature sender at radiator outlet - G83-

- At bottom radiator connection fitting ⇒ page 93

12 - Coolant temperature sender - G62-

- in coolant regulator housing ⇒ page 95

13 - 6-pin plug

- Lambda probe - G39-

14 - Hall sender - G40-

- at camshaft housing ⇒ page 49

15 - Lambda probe - G39-

- after pre-catalytic converter ⇒ page 156

16 - Ignition coils with a power output stage

- Ignition coil 1 with output stage - N70-
- Ignition coil 2 with output stage - N127-
- Ignition coil 3 with output stage - N291-
- Ignition coil 4 with output stage - N292-
- removing and installing ⇒ page 168

17 - Inlet camshaft control valve 1 - N205-

A - Potentiometer for intake manifold flap - G336-

- on fuel distributor (lower part of intake manifold) ⇒ page 136

B - Valve for intake manifold flap - N316-

- on the intake manifold ⇒ page 136

C - Injectors

- Injector, cylinder 1 - N30-
- Injector, cylinder 2 - N31-
- Injector, cylinder 3 - N32-
- Injector, cylinder 4 - N33-
- in fuel distributor (bottom part of intake manifold) ⇒ page 141
- removing and installing ⇒ page 146

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D - Engine speed sender - G28-

- ❑ at sealing flange for crankshaft - gearbox side - suction side
- ❑ removing and installing ⇒ page 33

E - Knock sensor 1 - G61-

- ❑ at cylinder block - suction side
- ❑ removing and installing ⇒ page 167

F - Fuel pressure sender - G247 -

- ❑ in fuel distributor (bottom part of intake manifold) ⇒ page 136

G - Intake air temperature sender 2 - G299-

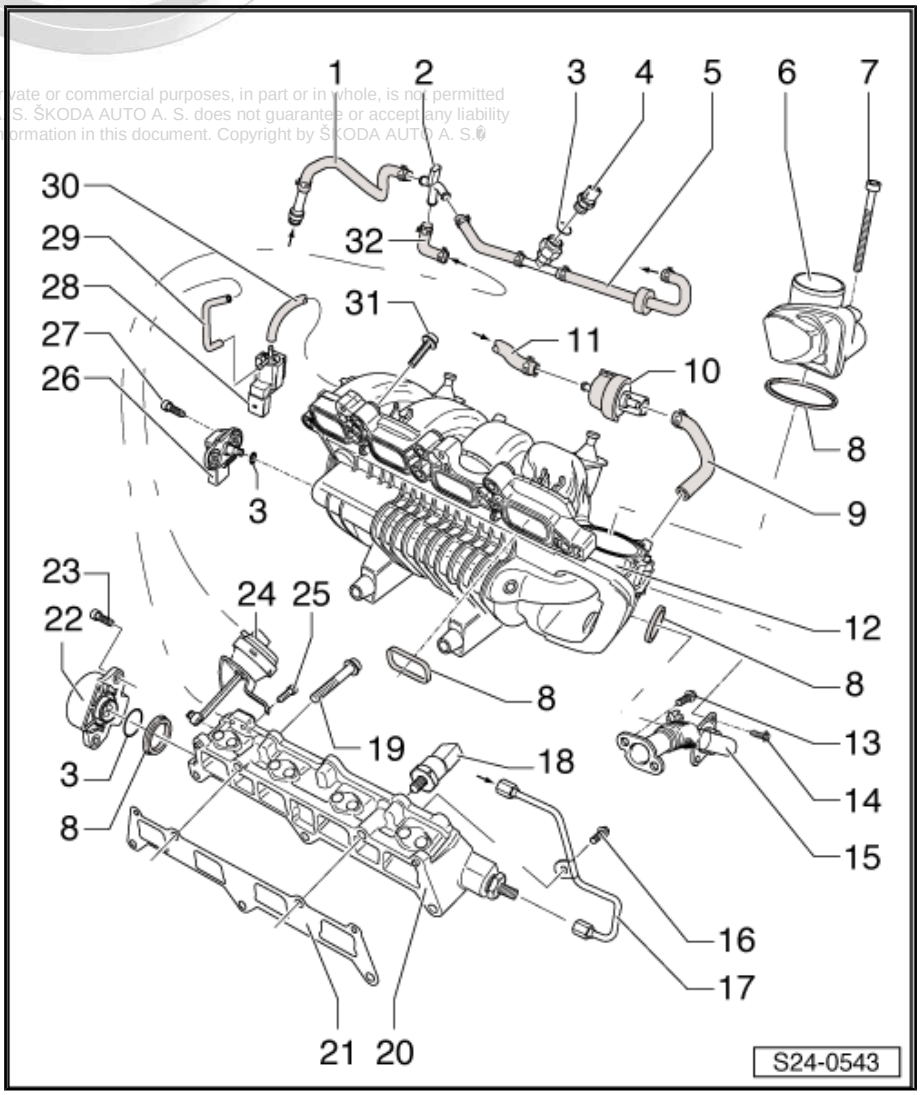
- ❑ in engine cover with integrated air filter ⇒ page 144

H - Accelerator pedal position sender - G79- and accelerator pedal position sender 2 - G185-

- ❑ in footwell on the accelerator pedal (both senders are located in a housing)

I - Lambda probe after catalytic converter - G130-

1.2 Assembly overview - intake manifold



1 - Fuel intake hose

- ❑ secure with spring strap clamps
- ❑ check for firm seating

2 - Distributor

- ❑ clipped into the vacuum valve for crankcase ventilation

3 - O-ring

- ❑ replace

4 - Fuel pressure sender for low-pressure - G410 -

- ❑ Tightening torque: 6 Nm
- ❑ mounted up to 05.05

5 - Fuel intake hose

- ❑ to fuel high pressure pump

6 - Throttle valve module - J338-

- ❑ After replacement, adapt the engine control unit to the throttle valve control unit ⇒ Vehicle diagnostic tester.
- ❑ Cleaning the throttle flap control unit - J338- ⇒ page 149

7 - 7 Nm

8 - Sealing ring

- ❑ replace

9 - Bleeder hose

10 - Activated charcoal filter solenoid valve 1 - N80-

- ❑ attached with bracket to the intake manifold

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11 - Bleeder hose

- ❑ from the activated charcoal filter system ⇒ page 131

12 - Intake manifold

- ❑ removing and installing ⇒ page 138
- ❑ Checking the vacuum reservoir in intake manifold for leak-tightness ⇒ page 140

13 - 8 Nm

14 - 5 Nm

15 - Connecting pipe

- ❑ to exhaust gas recirculation valve ⇒ page 165

16 - 8 Nm

17 - High pressure line

- ❑ removing and installing ⇒ page 150

18 - Fuel pressure sender - G247- , 22 Nm

- ❑ Before removing, release pressure in the high pressure section of the fuel system ⇒ page 3
- ❑ before installing, wet thread and sealing cone with clean engine oil

19 - 20 Nm

20 - Fuel distributor (bottom part of the intake manifold)

- ❑ with intake manifold flap
- ❑ removing and installing ⇒ page 141
- ❑ When replacing, the initialisation values must be deleted and the potentiometer for intake manifold flap - G336- must be adapted to the engine control unit - J220- ⇒ Vehicle diagnostic tester.
- ❑ Before removal, lock the vacuum setting element for intake manifold flap with a 2.5 mm drill
- ❑ after installing a new fuel distributor, remove the holding clamps of the vacuum setting element
- ❑ Do not unscrew or tighten screw connectors for the high-pressure line (is glued together)

21 - Gasket

- ❑ replace
- ❑ pay attention to correct installation position

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22 - Potentiometer for intake manifold flap - G336-

- ❑ When replacing, adapt the engine control unit ⇒ Vehicle diagnostic tester

23 - 2 Nm

24 - Vacuum setting element for intake manifold flap

- ❑ check ⇒ page 152

25 - 10 Nm

26 - Intake manifold pressure sender - G71- and intake air temperature sender - G42-

27 - 1.5 Nm

28 - Valve for intake manifold flap - N316-

29 - Vacuum hose

- ❑ to the vacuum setting element for intake manifold flap

30 - Vacuum hose

- ❑ from the intake manifold

31 - 20 Nm

32 - Fuel return-flow hose

- ❑ from the fuel distributor (bottom part of the intake manifold)
- ❑ blue/blue marking
- ❑ secure with spring strap clamps

❑ check for firm seating

1.3 Removing and installing intake manifold

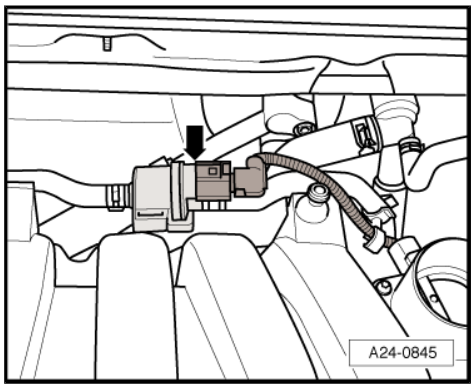
Removing

WARNING

Relieve pressure in the high pressure system ⇒ page 3 .

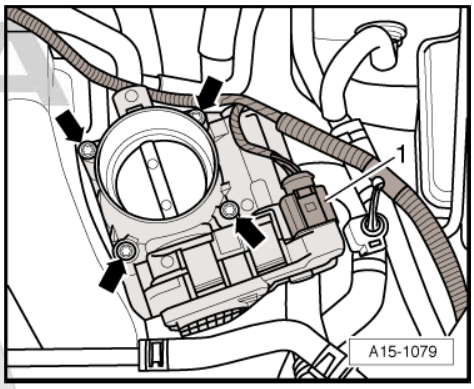
– Remove engine trim panel with air filter ⇒ page 145 .

– Disconnect electrical plug connection from solenoid valve 1 for activated charcoal filter - N80- .

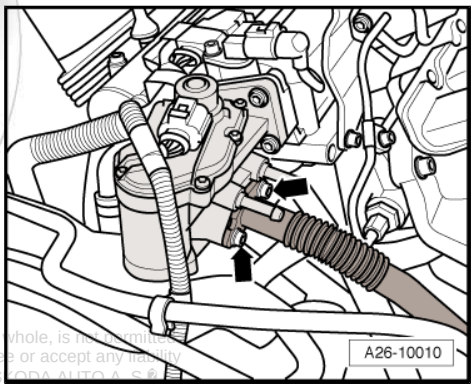


– Disconnect the electrical plug connections -1- at the exhaust flap control unit - J338- .

– Remove screws -arrows- and remove the throttle flap control unit - J338- .



– Unscrew the screws -arrows- of the connection pipe on the exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- , and remove seal.



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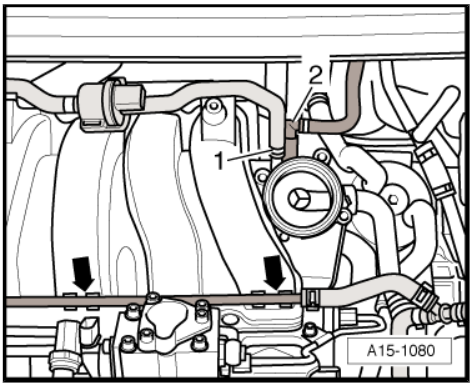
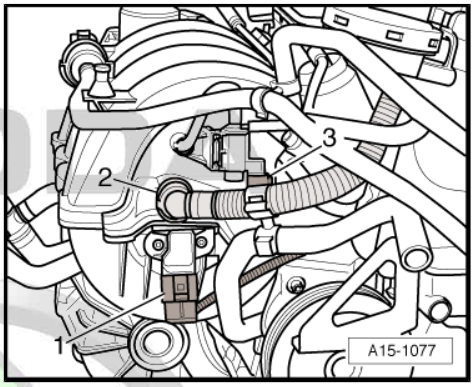
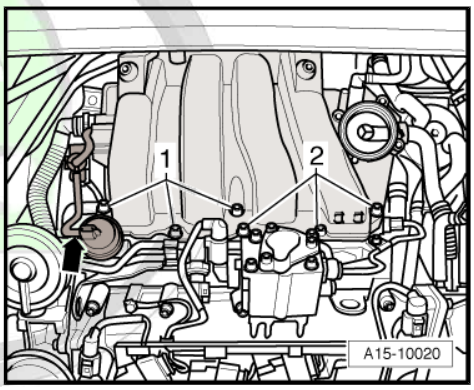
– Remove vacuum hose -1- to the electrical solenoid valve 1 for activated charcoal filter - N80- at the intake manifold.
– Unhook solenoid valve 1 for activated charcoal filter - N80- from the brackets and place to side with connected vacuum hoses.
– Remove vacuum line -2- to the brake servo unit from the intake manifold.
– Unclip the top coolant line from the intake manifold -arrows- and lay forwards.



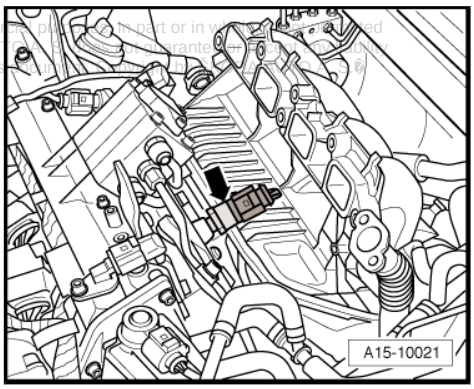
– Remove the hose -2- for the crankcase ventilation from the intake manifold, to do so press the release buttons.
– Disconnect the connectors -1- from the manifold pressure sender - G71- and -3- from the valve for intake manifold flap - N316- .



– Remove vacuum hose -arrow- from the positioning element for the intake manifold flap.
– Unscrew the fixing screws -1- and -2- for the intake manifold, and place the intake manifold to the rear.



– Unscrew fuel pressure sender - G247- -arrow-.
– Remove the intake manifold upwards towards the left.



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Install

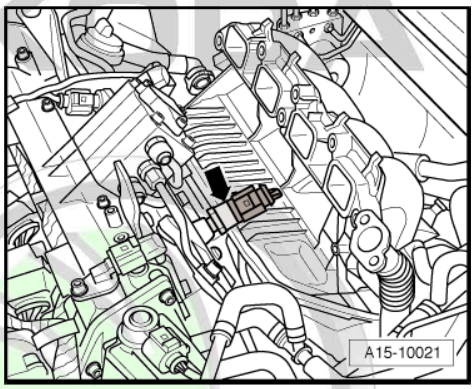
Installation is carried out in the reverse sequence. Pay attention to the following:

Note

- *Make sure no dirt can get into the intake manifold/fuel distributor (bottom part of the intake manifold).*
- *Always replace seals and gasket rings.*

– First of all, place down the intake manifold towards the rear of the engine compartment.

– Screw fuel pressure sender - G247- tight -arrow-.
– Screw the intake manifold on the fuel distributor tight.



1.4 Checking the vacuum reservoir in intake manifold for leak-tightness

Special tools and workshop equipment required

♦ Hand vacuum pump , e.g. -VAS 6213- or -V.A.G 1390-

Test condition

• Intake manifold is undamaged and the vacuum hoses are inserted correctly.

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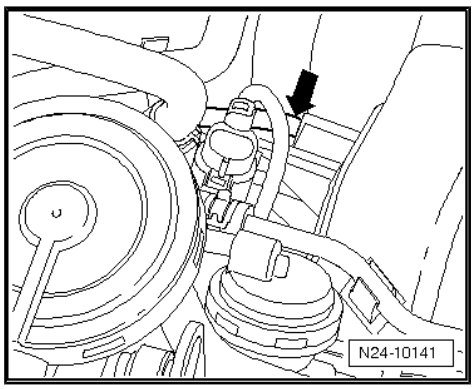
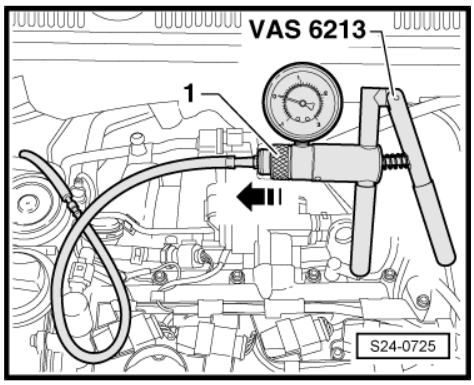
Test sequence

– Remove engine trim panel with air filter ⇒ page 145 .
– Vacuum hose -arrow- which connects the intake manifold and the valve for intake manifold flap - N316- from the intake manifold.



– Connect hand vacuum pump - VAS 6213 - to intake manifold.
– Slide the sliding ring -1- of the hand vacuum pump - VAS 6213- in the -direction of arrow- for “vacuum”.
– Actuate the hand vacuum pump until the vacuum reaches 0.03 MPa (0.3 bar).



Note

Through the large volume in the vacuum tank, up to 20 strokes may be necessary in order to generate a vacuum of 0.03 MPa (0.3 bar).

– Observe the pressure for approx. 3 ... 5 minutes.

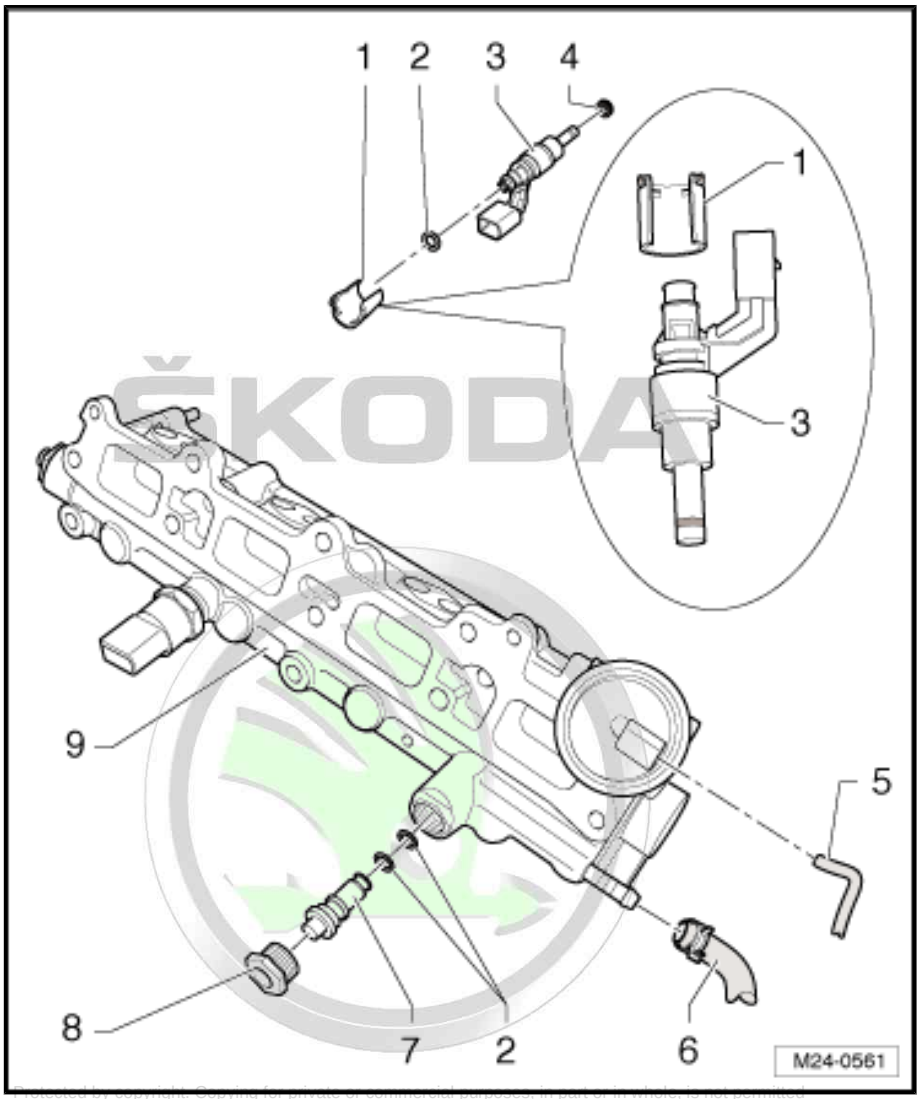
If the vacuum is at 0.03 MPa (0.3 bar):

The vacuum tank in the intake manifold is OK

If the vacuum drops:

– Replace intake manifold ⇒ page 138 .

1.5 Fuel rail with injection valves - Summary of components



1 - Retaining clip

- ❑ check correct seating on the injection valve and retaining bracket
- ❑ fit with the open side to the connector on the injection valve

2 - O-ring

- ❑ replace
- ❑ before fitting moisten lightly with clean engine oil

3 - Injector - N30 … N33-

- ❑ removing and installing ⇒ page 146

4 - Sealing ring

- ❑ replace ⇒ page 146
- ❑ The gasket ring must not be oiled

5 - Vacuum hose

- ❑ to the valve for intake manifold flap - N316- ⇒ page 136 , (lateral connection)

6 - Fuel return-flow hose

- ❑ to distributor in the fuel feed line ⇒ page 136
- ❑ blue/blue marking
- ❑ secure with spring strap clamps
- ❑ check for firm seating

7 - Pressure limiting valve

- ❑ replace removed valve
- ❑ before fitting O-rings moisten lightly with clean engine oil
- ❑ press in with 8 mm hexagon socket wrench

8 - Screw plug, 20 Nm

9 - Fuel distributor (bottom part of the intake manifold)

- ❑ removing and installing ⇒ page 141

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1.6 Removing and installing the fuel distributor (bottom part of the intake manifold)

Special tools and workshop equipment required

- ♦ Hand vacuum pump , e.g. -VAS 6213- or -V.A.G 1390-
- ♦ Drill ∅ 2.5 mm

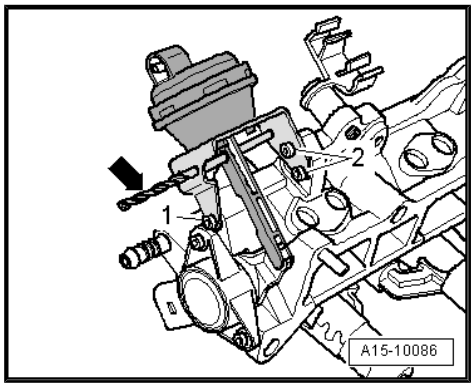
Removing

WARNING

Relieve pressure in the high pressure system ⇒ page 3 .

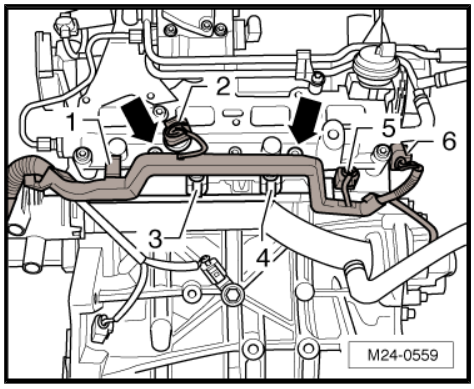
– Removing the intake manifold ⇒ page 138 .

– Press the operating rod of the vacuum setting element for the intake manifold flap in the direction of the positioning element and lock with a drill of ∅ 2.5 mm -arrow-.



– Disconnect connectors -1- to -6-.

– Remove screws -arrows- and remove the cable guide.

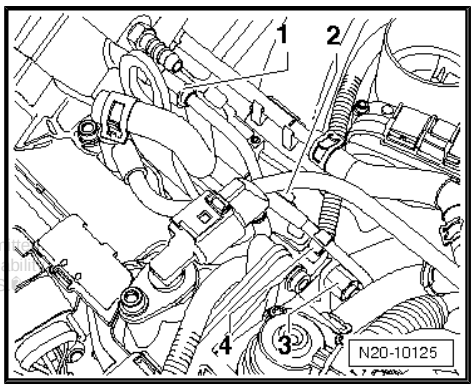


– Unscrew screw -2- on the cable guide and remove the clip -4- from the high-pressure line.

Note

Hold the screwed connections at the high pressure pump and at the fuel distributor when loosening the union nuts with a wrench.

– Unscrew the union nuts -1- and -3- at the high pressure line.



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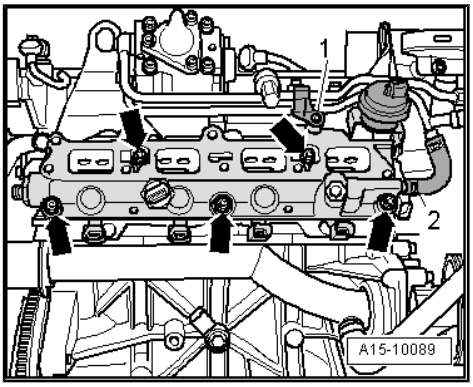
– Detach fuel feed line -2- at fuel distributor.
– Unscrew screws -arrows- and remove the fuel distributor.
– Removing and installing injection valves ⇒ page 146 .

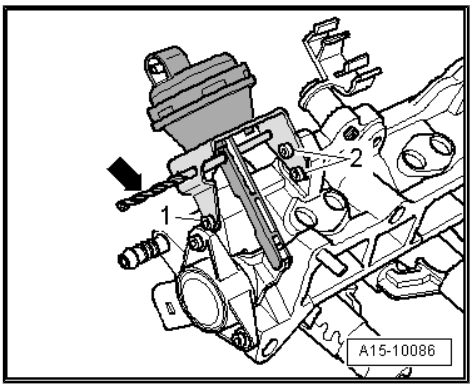


Install

Note

- *Replace gaskets and O-rings.*
- *When installing, ensure that the intake manifold flaps are not damaged.*

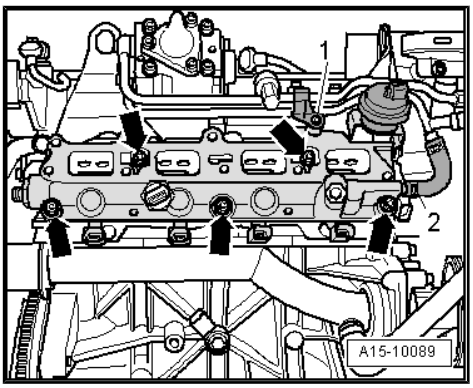
• The operating rod of the vacuum setting element for intake manifold flap must be locked with a drill ∅ 2.5 mm -arrow-.
– When fitting the fuel distributor onto the cylinder head, the intake manifold flap must be raised slightly.



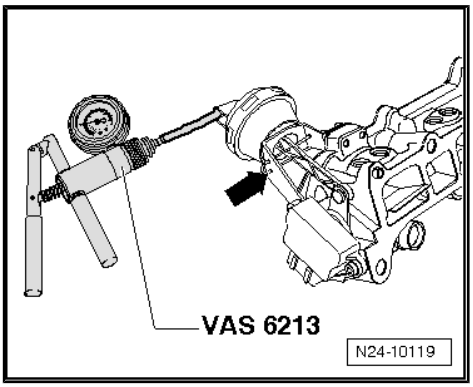
Note

Failing to observe this instruction can cause the intake manifold flap between the fuel distributor and cylinder head to catch making it no longer possible to actuate it in the assembled state

– Screw the fuel distributor -arrow- tight.
– Connect the fuel return pipe -2-.
– Check the function of the intake manifold flap with the hand vacuum pump - VAS 6213- .



– Connect hand vacuum pump - VAS 6213 - as shown.
– Pull out the drill/holding clamps -arrow-.



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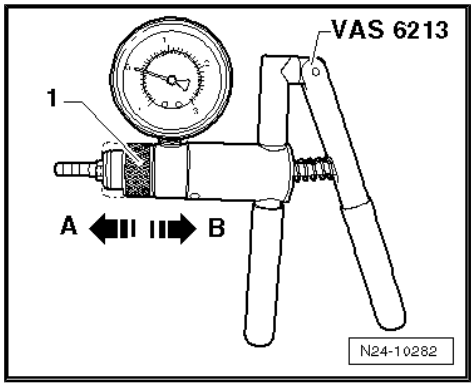
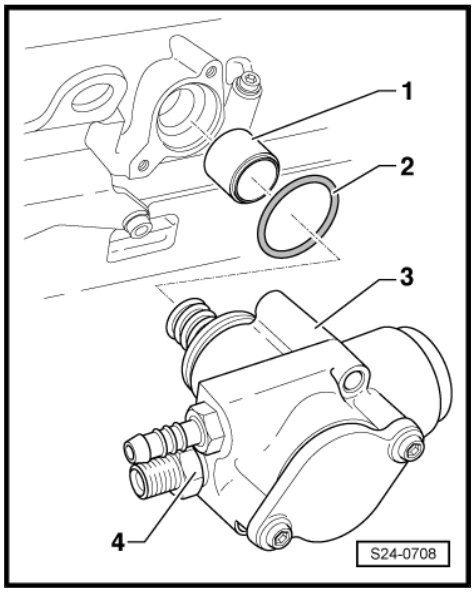
– Put the change-over ring -1- of the hand vacuum pump - VAS 6213- in position-A- for “vacuum”
– Generate a vacuum and test the function of the intake manifold flap with the operating rod.



– Check that the screw connectors -4- in the high pressure pump have a tightening torque of 40 Nm.
– Installing high pressure line ⇒ page 150 .

Further installation occurs in reverse order to removal.



1.7 Summary of components - air filter

The upper part of the air filter acts as a cover for the engine.

Removing and installing engine cover with air filter ⇒ page 145 .

Check control flap for intake air pre-heating ⇒ page 146 .

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1 - Air filter lower part

2 - Rubber bush

3 - Filter element

4 - 3 Nm

5 - Intake air temperature sender 2 - G299-

6 - O-ring

- ❑ replace

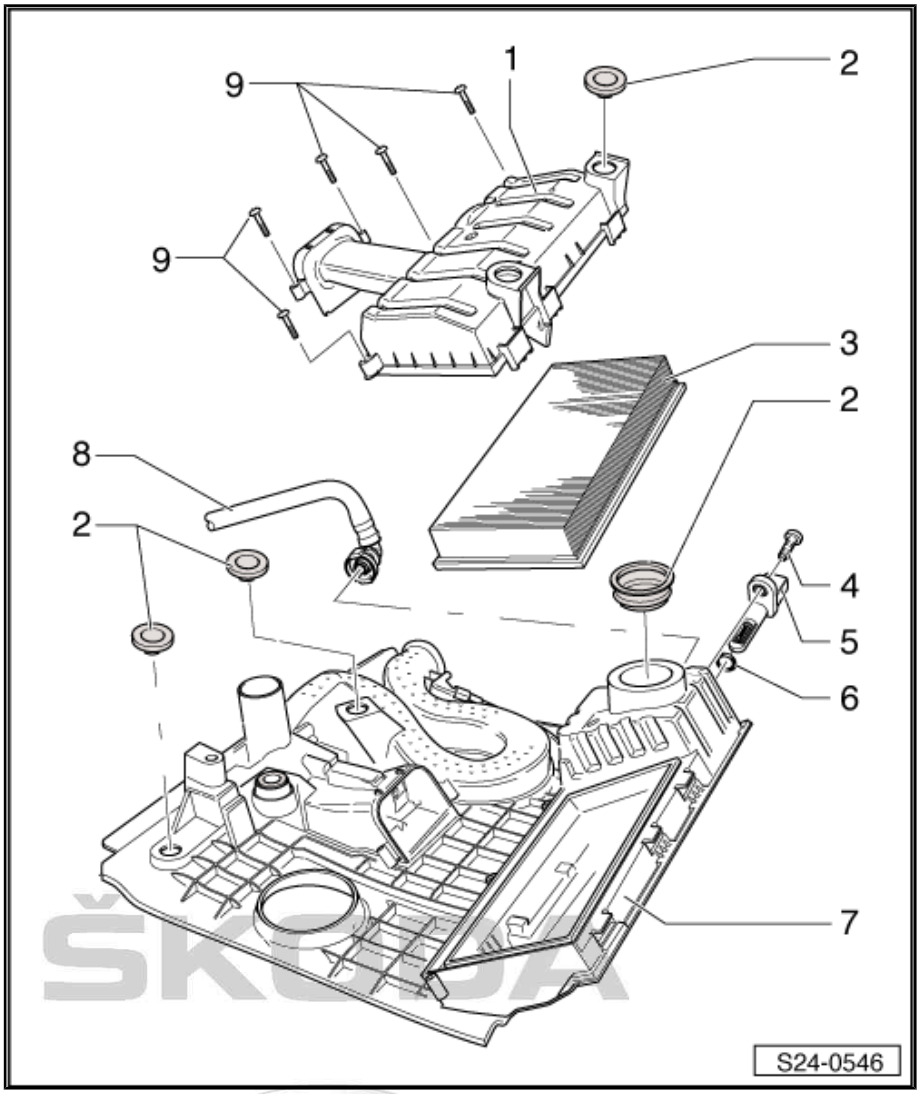
7 - Air filter upper part

8 - Vacuum hose

- ❑ from camshaft housing

9 - 3 Nm

- ❑ Follow tightening sequence (numbers are on the bottom part of the air filter)



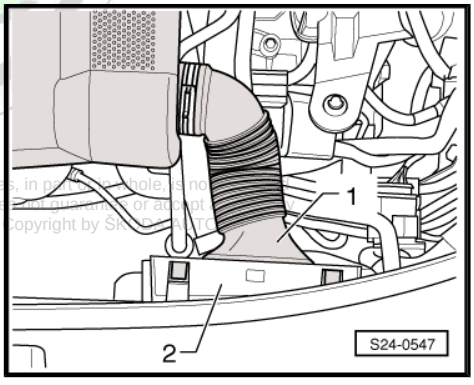
1.8 Removing and installing engine cover with air filter

Note

The air filter is integrated into the engine cover.

Removing

– Unclip the air intake hose -1- from the air guide -2- on top and to the side.



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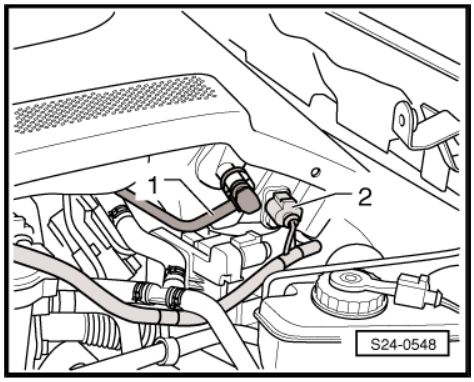
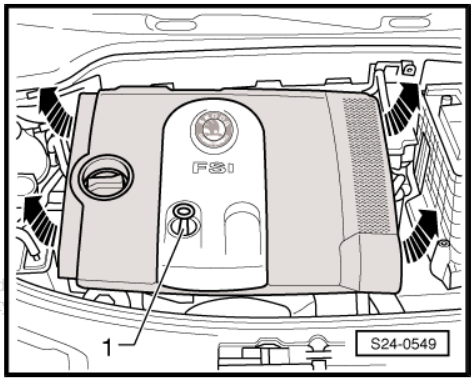
– Disconnect plug -2- from the intake air temperature sender 2 - G299- .

– Remove the vacuum line -1-.



– Pull out oil dipstick -1-.

– Remove the engine trim panel at the positions marked with -arrows-.



Install

Installation is carried out in the reverse sequence. Pay attention to the following:

– Make sure that the rubber bearings are clipped into the air filter.

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– Press the engine trim panel downwards in the area of the fastenings.

– Insert the dipstick into the guide pipe up to the stop.

1.9 Check control flap for intake air preheating

Special tools and workshop equipment required

♦ Cooling spray (commercially available)

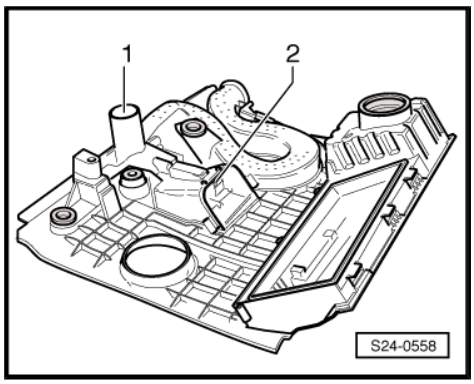
Test sequence

– Remove engine trim panel with air filter ⇒ page 145 .

– Remove bottom part of the air filter.

– Check position of the control flap -1-.

– Spray thermal element -2- with cooling spray.



• If the temperature exceeds +23 °C, the flap must seal the warm air connection.

• If the temperature is lower than +10°C, the flap must fully open the warm air connection.

1.10 Removing and installing injectors

Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .

Special tools and workshop equipment required

♦ Set of tools - T10133-

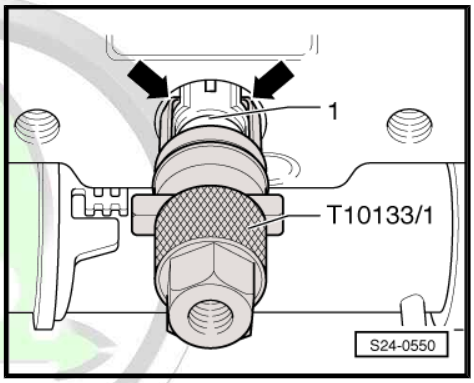
Removing

– Remove fuel distributor (bottom part of the intake manifold) ⇒ page 141 .

– Remove holding clamps from the injection valve.

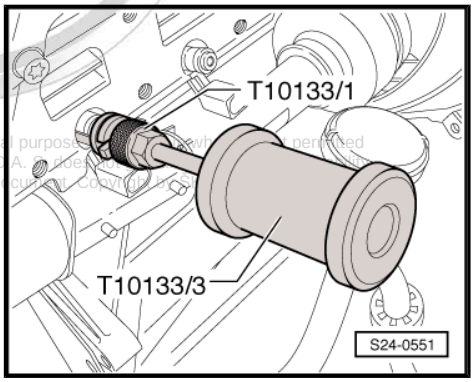
– Place extractor - T10133/1- on the injector -1-. Make sure that the hooks on the extractor latch in the recesses of the injection valve -arrows-.

– Tighten the knurled nuts of the extractor until hand-tight.



– Screw position hammer - T10133/3- onto the extractor - T10133/1- .

– Pull the injection valve out of the cylinder head using cautious knocking movements.



Install

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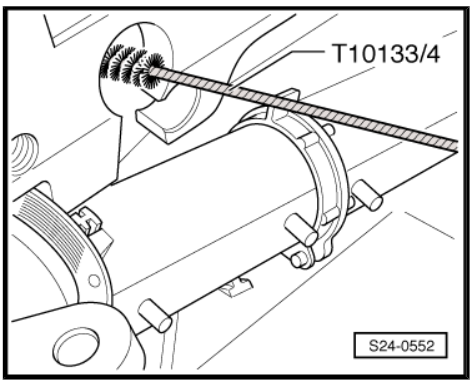
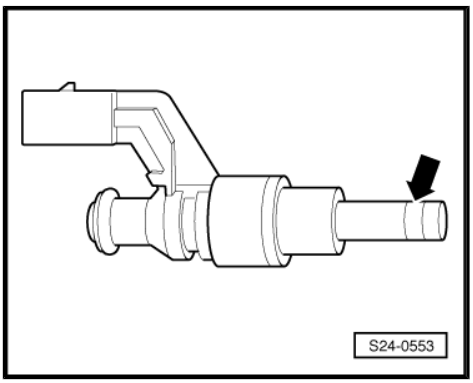
– Clean hole in the cylinder head using the nylon cylinder brush - T10133/4- .



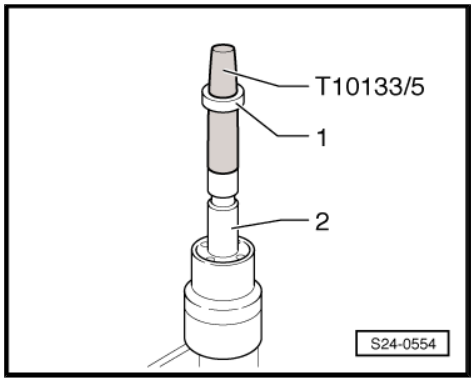
– Carefully clean the injection valve in the area of the gasket ring -arrow-. Remove the existing deposits (carbon deposits) with a wire brush.

– Carefully cut open gasket ring with a knife.

– Clean groove for gasket ring.



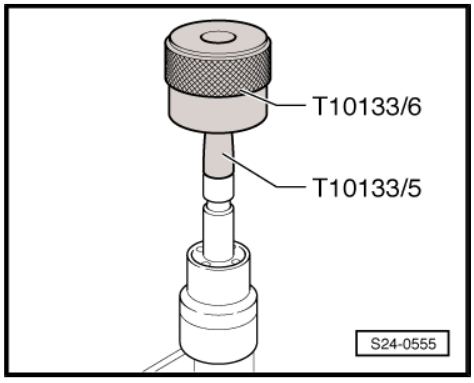
– Fit assembly cone - T10133/5- with a new sealing ring -1- onto the injector -2-.



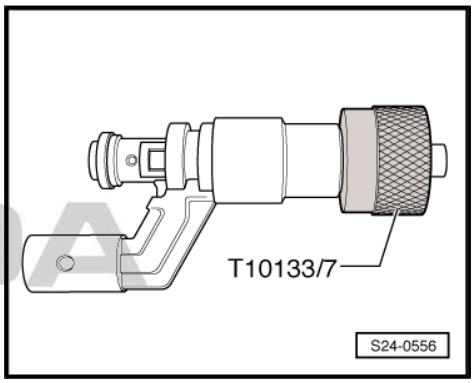
Note

The gasket ring must not be oiled.

– Slide the sliding ring with the assembly sleeve - T10133/6 - further on the assembly cone - T10133/5 - .
– Turn the assembly sleeve - T10133/6- and slide the sealing ring until it is in the groove.



– Press calibrating sleeve - T10133/7 - with a gentle rotary movement (approximately 180°) up to the stop onto the injector.
– Remove calibrating sleeve - T10133/7- again in the opposite direction of rotation.



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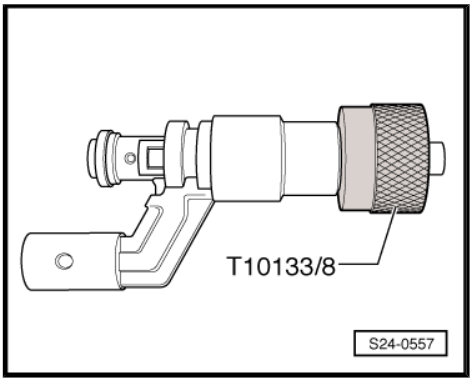
– Press calibrating sleeve - T10133/8 - with a gentle rotary movement (approximately 180°) up to the stop onto the injector.
– Turn calibrating sleeve -T10133/8- off again in the opposite direction.
– Replace O-ring at injection valve.
– Before installing, wet O-ring with clean engine oil.



Note

The gasket ring must not be oiled.

– Insert injection valve into the cylinder head.

Note

The injection valve must insert easily, if necessary wait until the gasket ring has been drawn together sufficiently.

– Install the holding clamp.

Further installation occurs in a similar way in reverse order to removal.

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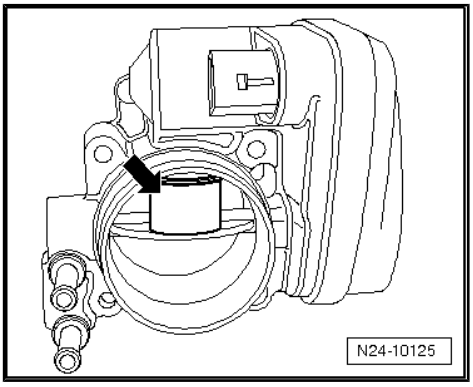
1.11 Clean throttle valve control unit - J338-

Note

- *If a new engine control unit is fitted, the throttle valve control unit must be adapted. The adaptation must only be carried out with a new or cleaned throttle valve control unit, because dirt/carbon deposits in the end stop of the throttle valve can lead to incorrect adaptation values.*
- *The throttle valve support must not be scratched when cleaning.*

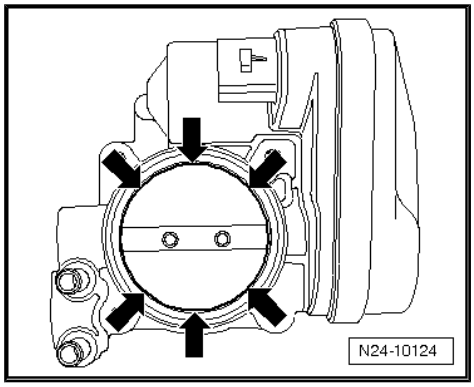
– Remove engine trim panel with air filter ⇒ page 145 .
– Remove throttle valve control unit.
– Open the throttle valve manually and block the throttle valve in the opened position with a suitable object -arrow-.



WARNING

Acetone is easily inflammable. Observe accident prevention regulations and safety notes when handling highly inflammable fluids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel.

– Thoroughly clean the throttle valve support, in particular the area of the closed throttle valve -arrows-, with commercially available acetone and a paint brush.
– Wipe the throttle valve support with a non-fluffy cloth.
– Let the acetone dry off completely and re-install the cleaned throttle valve control unit.
– Adapt the engine control unit to the throttle valve control unit ⇒ Vehicle diagnostic tester.



1.12 Removing and installing the high pressure pump

Observe the safety instructions ⇒ page 2 .

Observe rules for cleanliness ⇒ page 4 .

Condition

• The engine must be cold.

Removing

WARNING

Relieve pressure in the high pressure system ⇒ page 3 .

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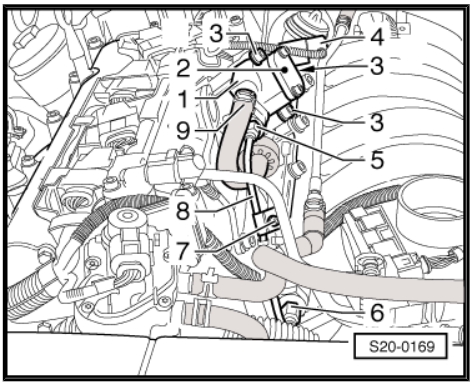
– Remove engine trim panel with air filter ⇒ page 145 .

– Detach the feed hose -9- from the fuel high pressure pump -1-.



Note

Collect the fuel which flows out with a cleaning cloth.

– Remove high-pressure line -8-. Unscrew union nuts -5- and -6- and screw -7-.
– Unplug connector -4-.
– Unscrew screws -3-.

Caution

Do not unscrew the cover-2-. Otherwise, there is the danger that inner parts of the fuel high pressure pump may be damaged.

– Pull the high pressure pump -1- and the bucket tappet out of the camshaft housing.

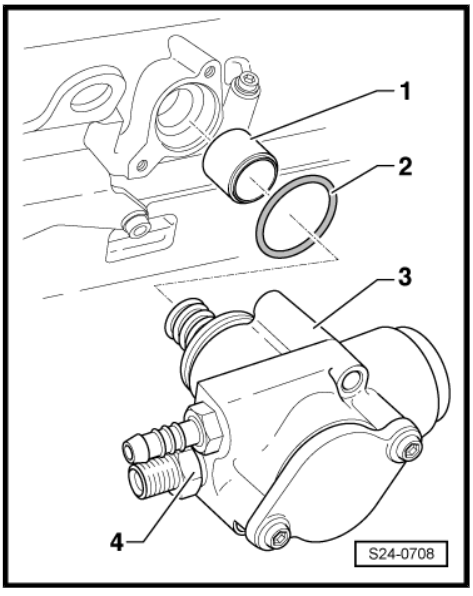
Install

Installation is carried out in the reverse order. When installing, observe the following:

Note

- *Always replace the O-ring of the high pressure pump.*
- *Replace damaged bucket tappet.*
- *Moisten the bucket tappet of the high pressure pump with clean engine oil.*

– Check that the screw connectors -4- in the high pressure pump have a tightening torque of 40 Nm.
– Slide the bucket tappet -1- into the camshaft housing.
– Insert a new, oiled O-ring -2- into the slot of the high pressure pump -3-.
– Position the high pressure pump -3- onto the camshaft housing.



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– Tighten fixing screws -3- on the fuel high pressure pump -1- to 8 Nm.

– Reconnect connector -4-.

– Install the high-pressure line -8- as follows:

1 - Screw in union nut -6- - only 2 thread turns.

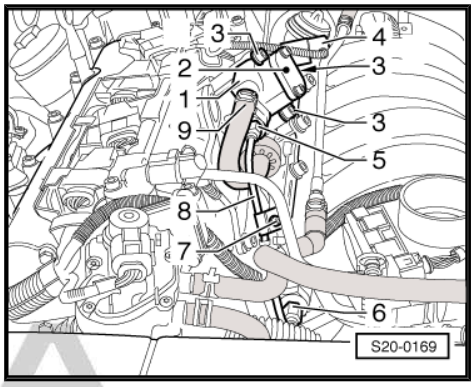
2 - Tighten union nut -5- - by hand.

3 - Tighten union nut -6- - by hand.

4 - Tighten screw -7- - to 8 Nm.

5 - Tighten union nut -6- to 18 Nm.

6 - Tighten union nut -5- to 18 Nm.



– Secure the feed hose -9- to the fuel high pressure pump -1-.

– Install engine trim panel with air filter ⇒ page 145 .

1.13 Test intake manifold changeover

Special tools and workshop equipment required

♦ Hand vacuum pump , e.g. -VAS 6213- or -V.A.G 1390-

Note

Observe all safety measures and notes for assembly work on the fuel system, on the injection and ignition system as well as rules for cleanliness ⇒ page 2 .

The test should only be carried out if there is a problem with a poor torque, i.e. if insufficient elasticity or poor pulling power exists.

Test condition

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• Valve for intake manifold flap - N316- has been tested ⇒ Vehicle diagnostic tester.

Test sequence

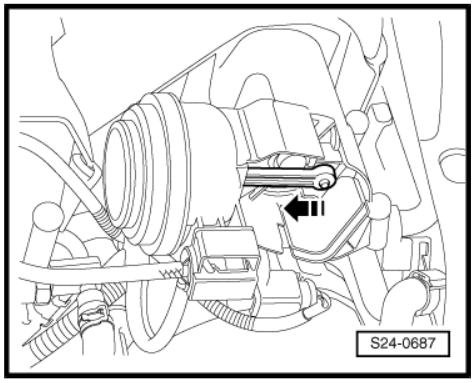
If the valve for intake manifold flap - N316- OK, carry out the following tests:

– Remove the engine trim panel with integrated air filter and place it to one side ⇒ page 145 . Do not undo the connector from the intake air temperature sender 2 - G299- .

– Start engine and run in idle.

– Have a second mechanic increase the engine speed suddenly. Note the vacuum setting element for intake manifold flap.

The positioning element must tighten -arrow-.



If the positioning element does not work as described:

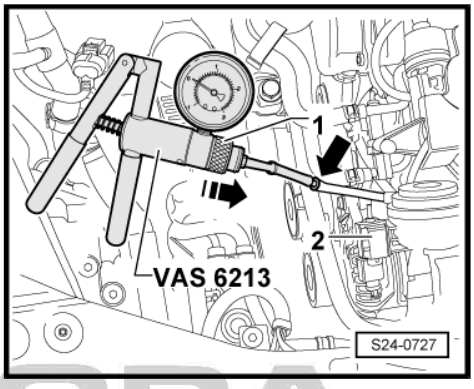
– Check vacuum system including dashpot at the intake manifold for leaks.

– Check the change-over mechanism for ease of movement. To do so, press tension rod by hand.

– Inspect vacuum lines to see that they are connected properly.

– Check vacuum hoses for porosity.

– Detach the vacuum hose to the positioning element for the intake manifold flap -arrow- from the intake manifold flap - N316 - -2-.
– Connect the hand vacuum pump - VAS 6213- on vacuum hose to the positioning element for intake manifold flap.
– Slide the sliding ring -1- of the hand vacuum pump - VAS 6213- in the -direction of arrow- for “vacuum”.

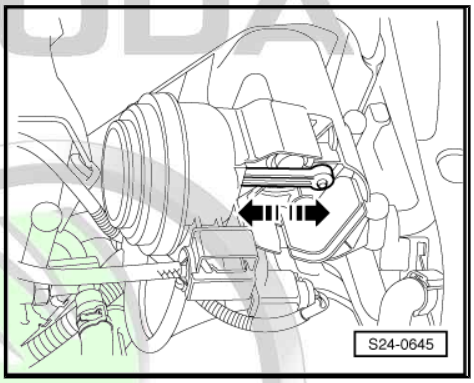


– Operate hand vacuum pump - VAS 6213- several times.

• The positioning element must move.

If the vacuum setting element does not move:

– replace the vacuum setting element.



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2 Engine control unit

2.1 Removing and installing engine control unit

Special tools and workshop equipment required

- Body saw e.g. -V.A.G 1523 A-

Note

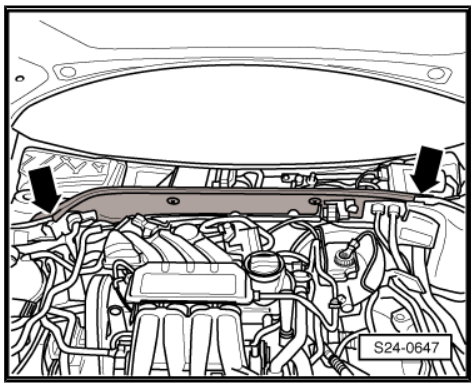
If the engine control unit must be replaced, clean the throttle valve ⇒ page 149 , ⇒ Vehicle diagnostic tester connect, and in Targeted fault finding, carry out "Replace engine control unit".

Removing

– Switch off ignition.

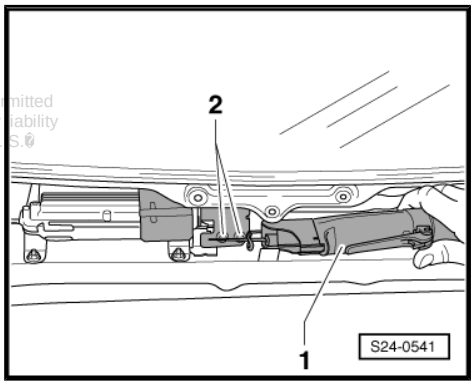
– Remove the cooling water tank cover ⇒ Rep. gr. 66 ; Body Work .

– Remove bulkhead plenum chamber -arrows-.



For vehicles with protective housing

– Cut with body saw -1- a slot for the cross-head screwdriver in the heads of the pull-off screws -2-.



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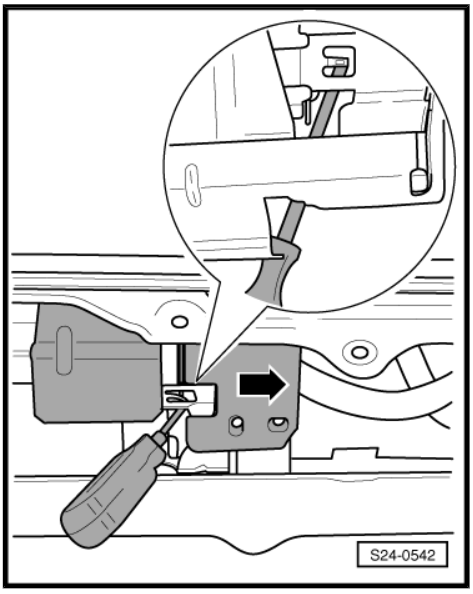
Note

- *It must be sawed twice with the body saw, so that the slot is wide enough, in order to unscrew the screws with a suitable screwdriver.*
- *The pull-off screws until are inserted with locking agent.*

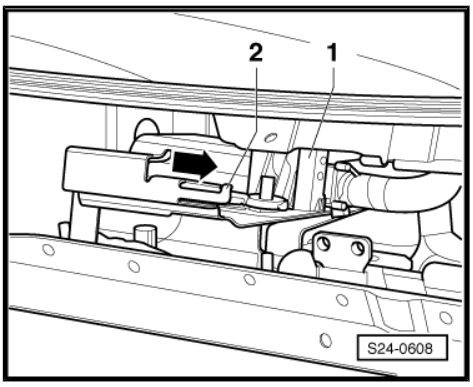
– Unscrew screws -2-.

– Lift locking tab of protective cover with a cross-head screwdriver.
– Push the protective cover in the -direction of the arrow- out of the bracket for engine control unit.



Continued for all vehicles

– Disconnect front plug -1- and remove from engine control unit.
– Lever off retaining bracket -2- slightly.
– Push engine control unit out of the bracket -arrow-.
– Disconnect rear plug and remove from engine control unit.



Install

Note

For vehicles with protective housing, the metal swarf must be suctioned out of the plenum chamber before installing the engine control unit.

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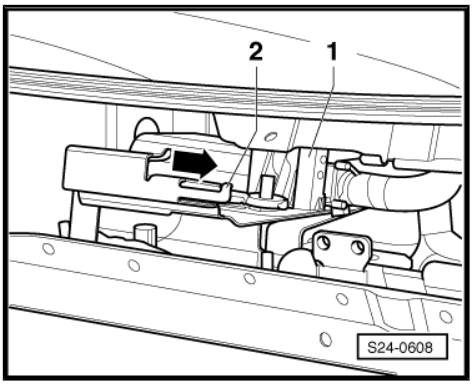
– Connect rear plug to engine control unit and lock.
– Push engine control unit into the bracket and lock the retaining bracket -2-.
– Connect front plug to engine control unit and lock.



For vehicles with protective housing

– Fasten protective cover with new pull-off screws (before tightening align the protective cover in such a way that it does not come into contact with the surrounding components)
– Tighten pull-off screws evenly until the screw heads are pulled off.

Continued for all vehicles

– Install bulkhead plenum chamber and plenum chamber cover ⇒ Body Work; Rep. gr. 66 .

26 – Exhaust system

1 Removing and installing parts of the exhaust system

Note

- *The decoupling element of the front part of the exhaust system should not be bent by more than 30° - risk of damage.*
- *Replace the gaskets and the self-locking nuts.*
- *When performing installation work on the exhaust system, make sure the exhaust system is not mounted under tension (except for chapter "Align exhaust system free of stress") and has adequate clearance from the vehicle body. If necessary, slacken the front clamping sleeve and align the exhaust system so as to create all round adequate clearance to the body and so that the weight is evenly distributed over the hangers.*

1.1 Exhaust manifold and pre-exhaust pipe - Summary of components

1 - Warm air baffle plate/heat shield

2 - 10 Nm

3 - Exhaust manifold

removing and installing
⇒ page 159

4 - Gasket

- ❑ replace

5 - 25 Nm

- ❑ replace
- ❑ Coat stud bolts in the cylinder head with hot bolt paste - G 052 112 A3-

6 - 40 Nm

- ❑ replace
- ❑ Coat stud bolts of pre-catalytic converter with hot bolt paste - G 052 112 A3- before installing.
- ❑ observe the order of tightening up
⇒ page 158

7 - Support

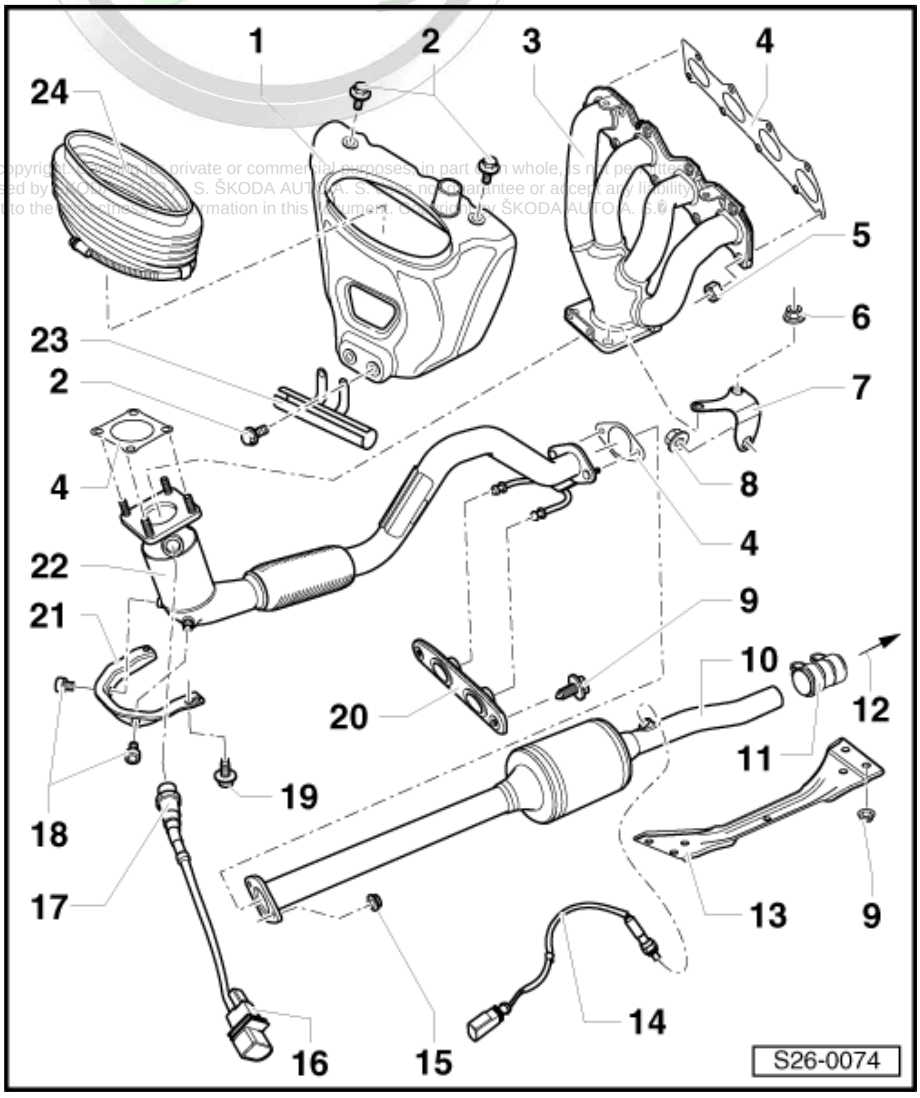
8 - 60 Nm

- ❑ on gearbox screw

9 - 23 Nm

10 - Catalytic converter

- ❑ protect against shocks and blows



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11 - Front clamping sleeve, 23 Nm

- ❑ Before positioning, align the exhaust system free of stress when cold ⇒ page 163
- ❑ Fitting position ⇒ page 158
- ❑ Tighten screwed connections uniformly

12 - to middle part of exhaust system

13 - Front tunnel bridge

14 - Lambda probe downstream of catalytic converter - G130- , 50 Nm

- ❑ the thread of new lambda probes must be coated with assembly paste
- ❑ for re-used lambda probe, only coat the thread with hot bolt paste - G 052 112 A3- ; the hot bolt paste - G 052 112 A3- must not get into the slots of the probe body
- ❑ the 4-pin connector is located on the underbody under the right-hand trim

15 - 25 Nm

- ❑ replace
- ❑ Coat stud bolts with hot bolt paste - G 052 112 A3-

16 - Connector

- ❑ for Lambda probe - G39- , black, 6-pin

17 - Lambda probe - G39- , 50 Nm

- ❑ the thread of new lambda probes must be coated with assembly paste
- ❑ for re-used lambda probe, only coat the thread with hot bolt paste - G 052 112 A3- ; the hot bolt paste - G 052 112 A3- must not get into the slots of the probe body

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18 - 40 Nm

- ❑ observe the order of tightening up ⇒ page 158

19 - 23 Nm

- ❑ observe the order of tightening up ⇒ page 158

20 - Hanger

- ❑ replace if damaged

21 - Support

- ❑ observe the order of tightening up ⇒ page 158

22 - Front part of exhaust system with pre-catalytic converter

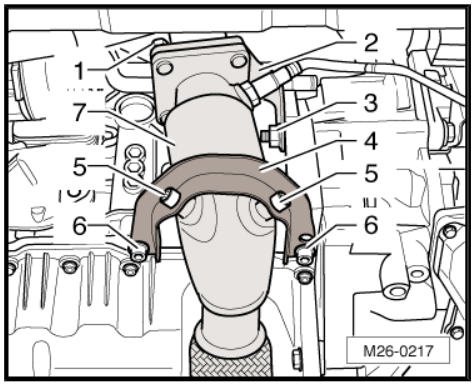
- ❑ The decoupling element on the pre-catalytic converter should not be bent by more than 30° - risk of damage.
- ❑ protect against shocks and blows
- ❑ removing and installing ⇒ page 161

23 - bracket for wire harness

24 - Bellows

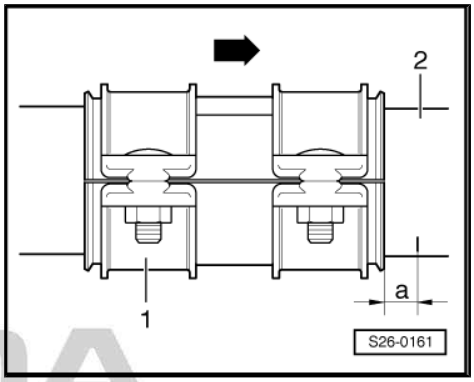
- ❑ mounted up to 04.06

tightening sequence of screws for pre-catalytic converter at exhaust manifold and engine



- Fit pre-catalytic converter -7- with new seal onto exhaust manifold.
- Fit mounting bracket -2- for pin bolts onto the pre-catalytic converter and for the gearbox screw.
- Tighten nuts-1- to 40 Nm.
- Tighten nuts-3- to 60 Nm.
- Slide the mounting bracket -4- up to stop towards the cylinder block and tighten screws -6- to 23 Nm.
- Tighten screws -5- to 40 Nm.

Installation position of front clamp



The -arrow- shows the direction of travel.

- Align front clamping sleeve -1- to the marking on the pipe with the catalytic converter -2-.

  -a- = 5 mm

The fixing screws must be located on the right. The screws must not protrude beyond the bottom edge of the front clamping sleeve.

1.2 Middle or rear part of the exhaust system - Summary of components

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1 - From the catalytic converter

2 - Hanger

3 - Retaining strap

- ❑ replace if damaged

4 - 23 Nm

5 - Rear clamping sleeve

- ❑ for connecting middle or rear part of the exhaust system

6 - 23 Nm

7 - Rear part of exhaust system

- ❑ for first equipment building unit with middle part of exhaust gas system, replace individually when carrying out repairs
- ❑ replace ⇒ page 163

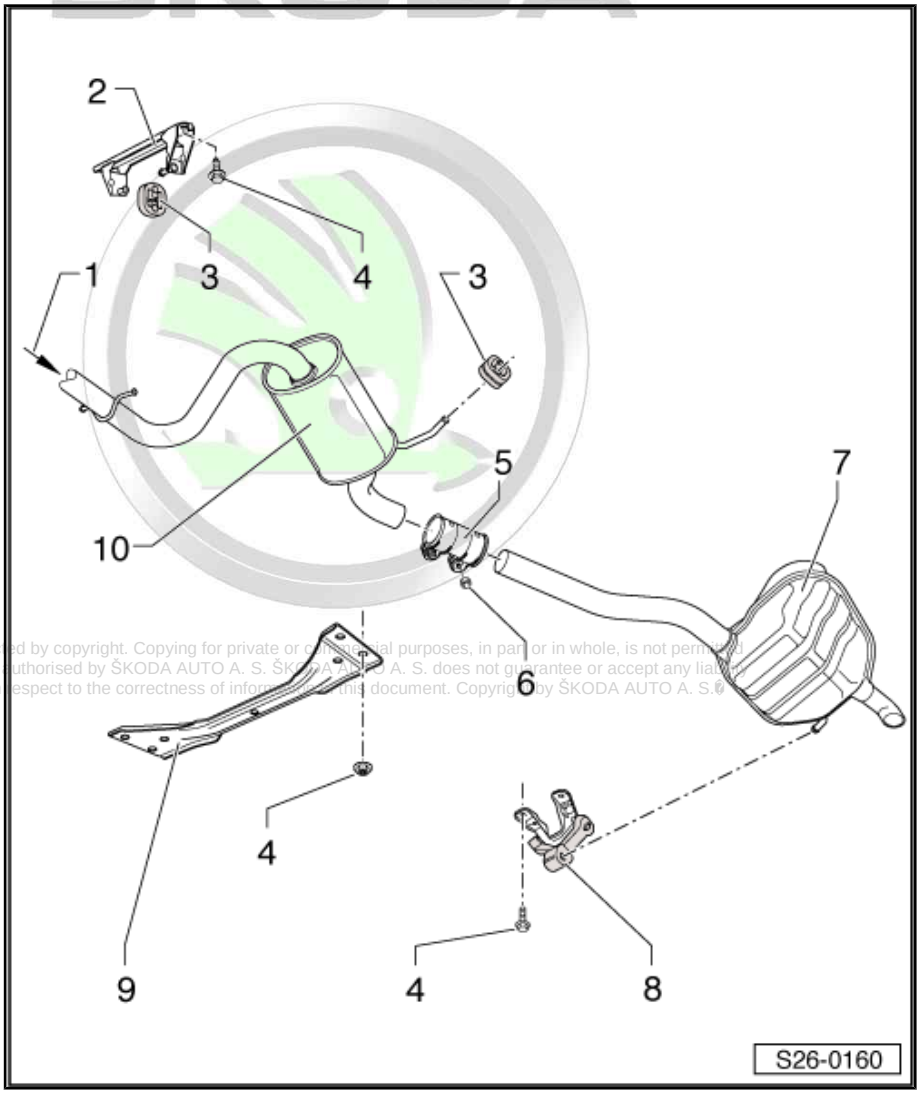
8 - Hanger

- ❑ replace if damaged

9 - Rear tunnel bridge

10 - Middle part of exhaust system

- ❑ for first equipment building unit with rear part of exhaust gas system, replace individually when carrying out repairs
- ❑ replace ⇒ page 163



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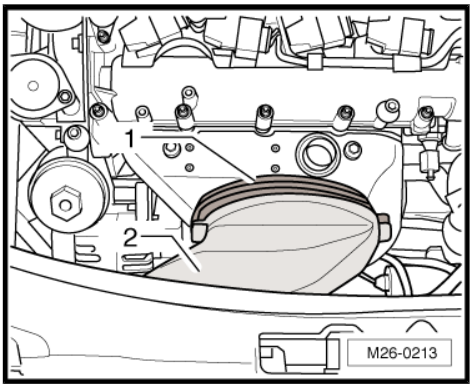
1.3 Removing and installing exhaust manifold

Removing

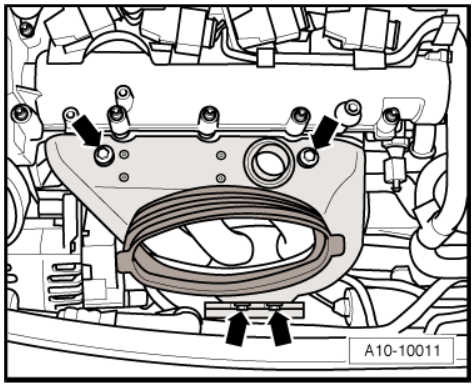
– Remove engine trim panel with air filter ⇒ page 145 .

– Disconnect bellows -1- (if present) from the air guide -2-.

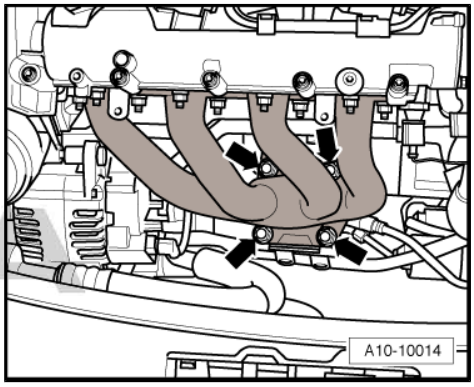
– Remove both catches and remove the air guide -2-.



– Unscrew heat shield -arrows-.

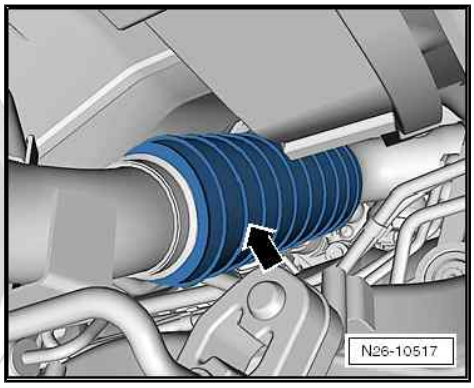


– Unscrew pre-catalytic converter from the exhaust manifold -arrows-.
– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .

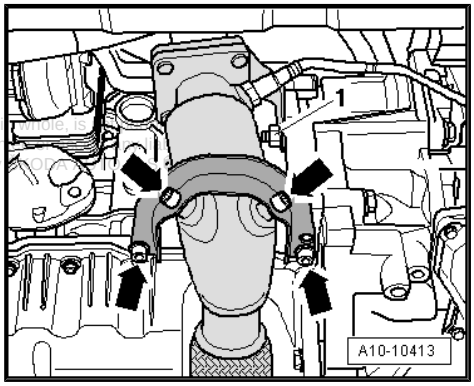


Note

- *The decoupling element on the pre-catalytic converter should not be bent by more than 30° - risk of damage.*
- *Secure decoupling element with transport security - T10403- -arrow-.*



– Remove bolts -arrows-.
– Unscrew nuts -1- from the mounting bracket for exhaust manifold/gearbox. Remove mounting bracket.
– Secure pre-catalytic converter against falling.



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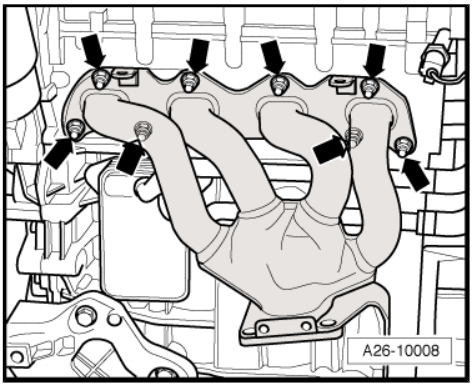
– Unscrew pre-catalytic converter from the cylinder head -arrows-.

– Remove exhaust manifold with the seal upwards.



Install

Installation is carried out in the reverse sequence. Pay attention to the following:

- Replace the gaskets and the self-locking nuts.
- Coat stud bolts in the cylinder head with hot bolt paste - G 052 112 A3-
- Note tightening sequence when securing pre-catalytic converter ⇒ page 158 .

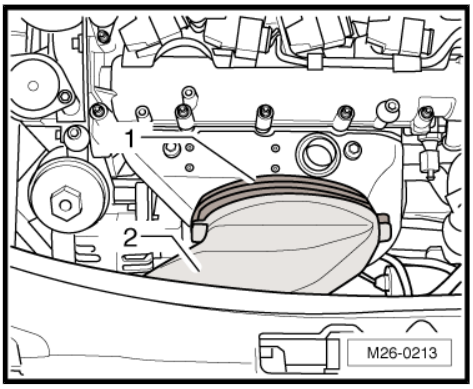
1.4 Installing and removing the front part of the exhaust system with pre-catalytic converter.

Removing

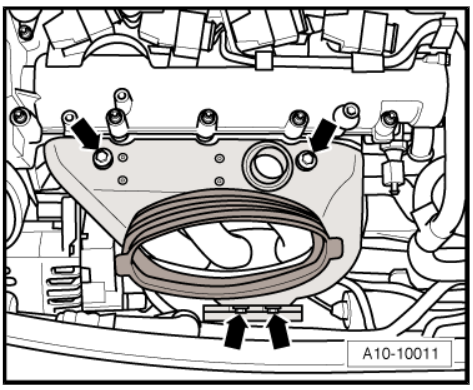
– Remove engine trim panel with air filter ⇒ page 145 .

– Disconnect bellows -1- (if present) from the air guide -2-.

– Remove both catches and remove the air guide -2-.



– Unscrew heat shield -arrows-.



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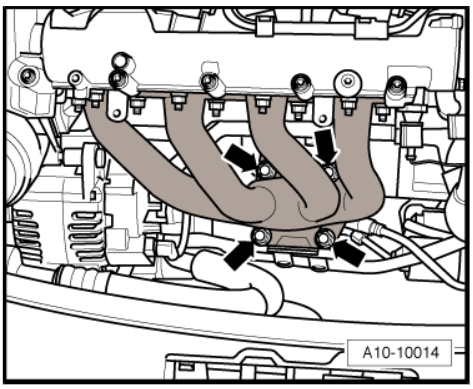
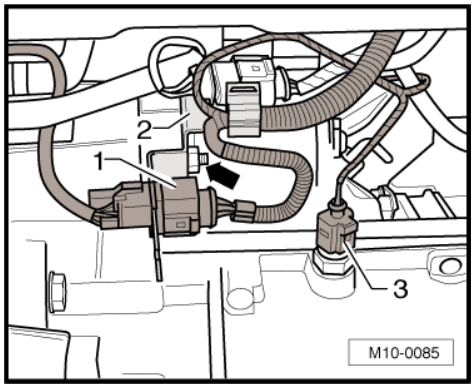
– Unscrew pre-catalytic converter from the exhaust manifold -arrows-.

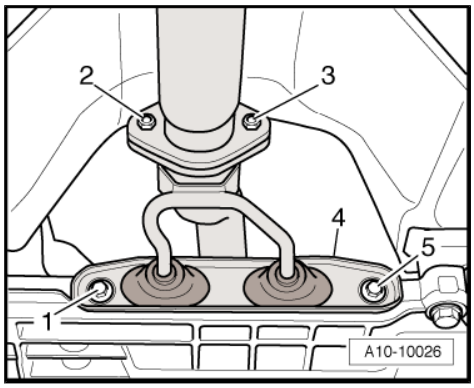
– Remove the sound dampening system ⇒ Rep. gr. 50 ; Body Work .



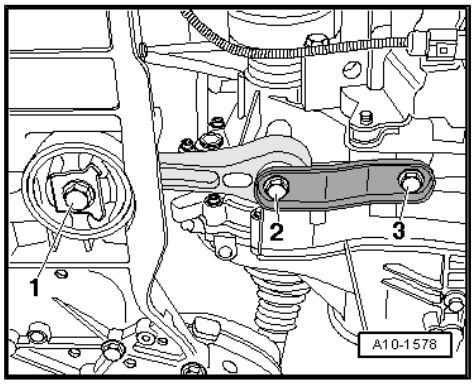
– Take plug connection -1- for lambda probe - G39- out of the holder -2- and disconnect.



– Unscrew screws -1- and -5-.
– Remove suspension -4- for exhaust system from the pin bolts on the pre-catalytic converter.
– Unscrew nuts -2- and -3- from the flange for the exhaust system.
– Disconnect exhaust system from the flange.



– First, unscrew the screw -1-.
– Unscrew screws -2- and -3- and remove the pendulum support.



Note

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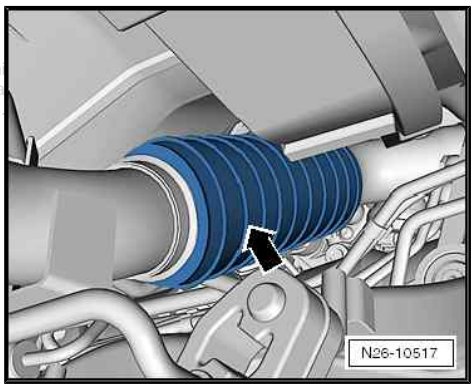
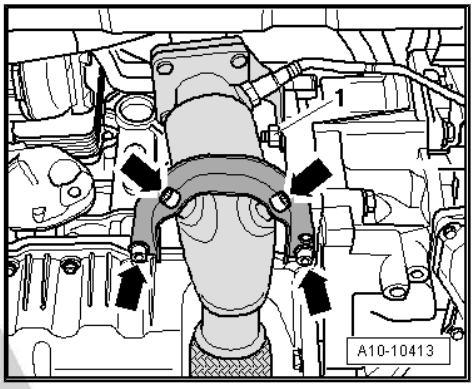
- *The decoupling element on the pre-catalytic converter should not be bent by more than 30° - risk of damage.*
- *Secure decoupling element with transport security - T10403- -arrow-.*





– Unscrew the nut -1- and remove the holder from the gearbox/ exhaust manifold.
– Release screws -arrows- and remove holder.
– Swivel out the front part of the exhaust system towards the front.

Install

Installation is carried out in the reverse sequence. Pay attention to the following:

- Replace the gaskets and the self-locking nuts.
- Lightly coat pin bolts on the pre-catalytic converter with hot bolt paste - G 052 112 A3- .
- Note the tightening sequences for attaching the pre-catalytic converter ⇒ page 158
- Install pendulum support ⇒ page 19 .

1.5 Replacing middle or rear part of the exhaust system

Special tools and workshop equipment required

- Body saw e.g. -V.A.G 1523 A-
- Protective goggles

Work procedure

Note

- *For individually replacing the middle or rear part of the exhaust system, a separation point is provided in the connecting pipe.*
- *The separation point is marked by indentations on the circumference of the exhaust pipe.*

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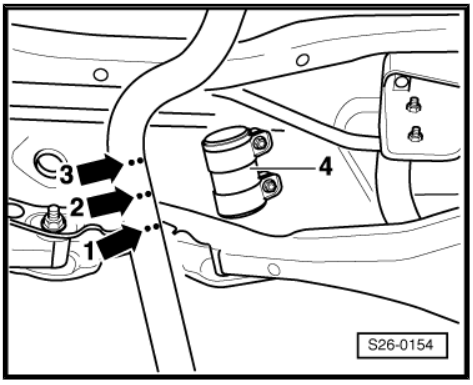
WARNING

In order to avoid injuries because of metal swarfs, wear safety goggles and safety clothing.



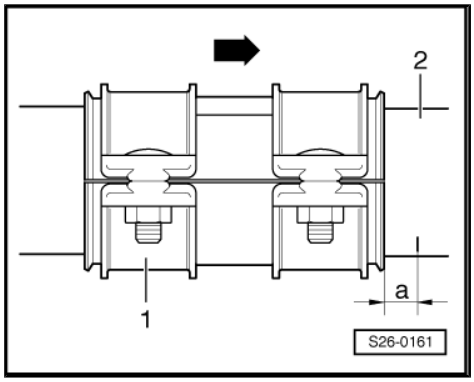
– Separate exhaust pipe at the separation point -arrow 2- with body saw (e.g. -V.A.G 1523 A-) at a right angle.
– When installing, position rear clamping sleeve -4- at the side markings -arrow 1- and -arrow 3-.
– Turn the rear clamping sleeve -4- in such a way that the ends of the screws are as far upwards as possible.
– Align rear part of exhaust system horizontally and tighten rear clamping sleeve to 23 Nm.
– Align exhaust system free of stress ⇒ page 163 .

1.6 Aligning exhaust system free of stress

- The exhaust system is aligned when cold.

– Slacken front clamping sleeve -1- and align to pipe with catalytic converter -2- (-arrow- points in direction of travel).

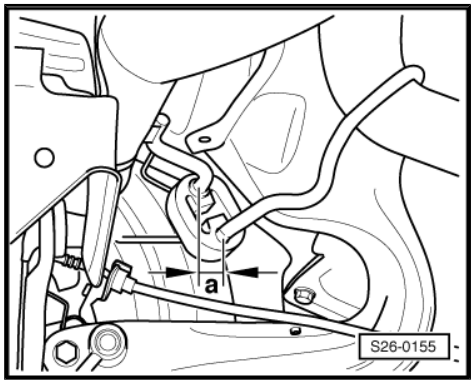
  -a- = 5 mm



The fixing screws must be located on the right. The screws must not protrude beyond the bottom edge of the clamping sleeve.

– Tighten front nut by hand.

– Push the exhaust system so far forward until the initial load -dimension a- on the retaining strap at the middle part of the exhaust system is 9...11 mm.



– Tighten the nuts of the front clamping sleeve evenly to 23 Nm.

Align exhaust tailpipe

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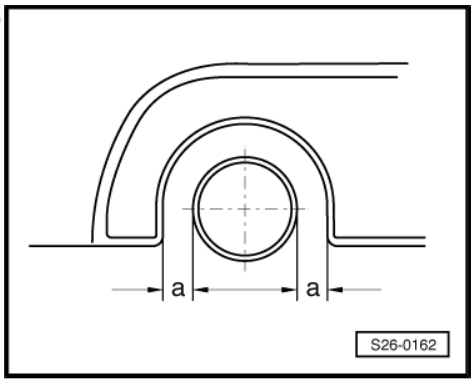
– Align rear part of exhaust system in such a way that there is an equal distance -a- on the left and right between bumper opening and exhaust tailpipes.



For centering, if necessary the hangers of the exhaust system must be loosened.

1.7 Inspecting the exhaust system for leak tightness

– Start engine and run in idle.

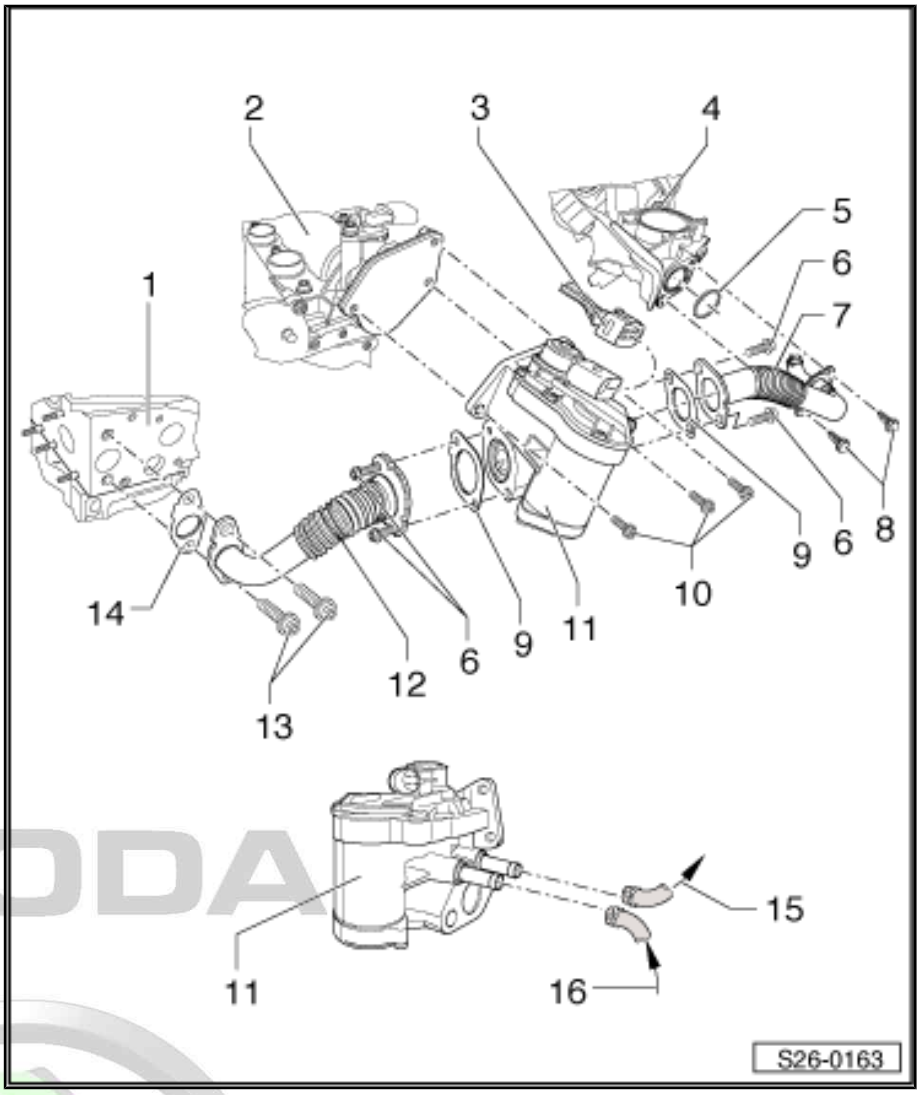
– Seal off exhaust tailpipe for the duration of the leak check (e.g. with cloth or plug).

– Inspect all the connection points (cylinder head/exhaust manifold, exhaust manifold/front part of exhaust system, etc.) for leak tightness by listening and visual inspection.

– Eliminate any leak found.

2 Exhaust gas recirculation system

2.1 Exhaust gas recirculation - Summary of components



1 - Cylinder head

2 - Camshaft housing

3 - Connector

- ❑ 6-pin, grey

4 - Intake manifold

5 - Gasket

- ❑ replace

6 - 8 Nm

7 - Connecting pipe

- ❑ Screw free of stress

8 - 7 Nm

9 - Gasket

- ❑ replace

10 - 10 Nm

11 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

- ❑ removing and installing ⇒ page 166
- ❑ When replacing, adapt the engine control unit to the exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- ⇒ Vehicle diagnostic tester

12 - Connecting pipe

- ❑ Screw free of stress

13 - 18 Nm

14 - Gasket

- ❑ replace
- ❑ pay attention to correct installation position ⇒ page 166

15 - To expansion reservoir/heat exchanger

- ❑ connection diagram for coolant hoses ⇒ page 97

16 - From the T-piece/radiator connection top

- ❑ connection diagram for coolant hoses ⇒ page 97

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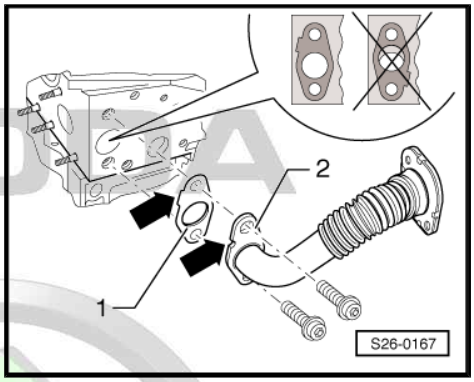
Fitting position of the seal on the cylinder head

The peg on the seal -1- must lie flush with the recess on the connection pipe -2- -arrows-.



2.2 Removing and installing exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

Removing

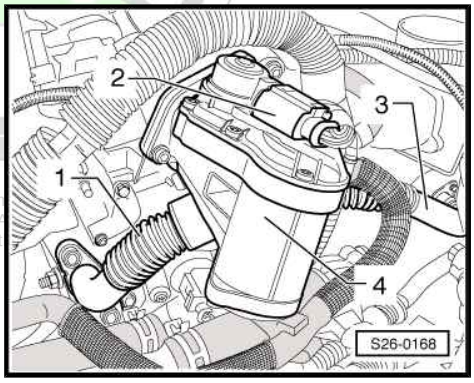
– Remove engine trim panel with air filter ⇒ page 145 .

– Remove connection pipes -1- and -3-.

  Swivel out connection pipe -3- towards the top and out of the intake manifold.

– Unplug connector -2-.

– Remove exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- -4- from the camshaft housing and place to side with connected coolant hoses.



Note

When fully removing the exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- , the coolant hoses must be unclamped and removed beforehand.

Install

Installation is carried out in the reverse sequence. However, pay attention to the following:

- Replace the seals and gasket ring in the intake manifold.
- Note fitting position of the seal on the cylinder head ⇒ page 166 .
- Screw connection pipes free of stress. Before tightening, screw in all screws until hand tight.
- Tightening torques ⇒ page 165 .

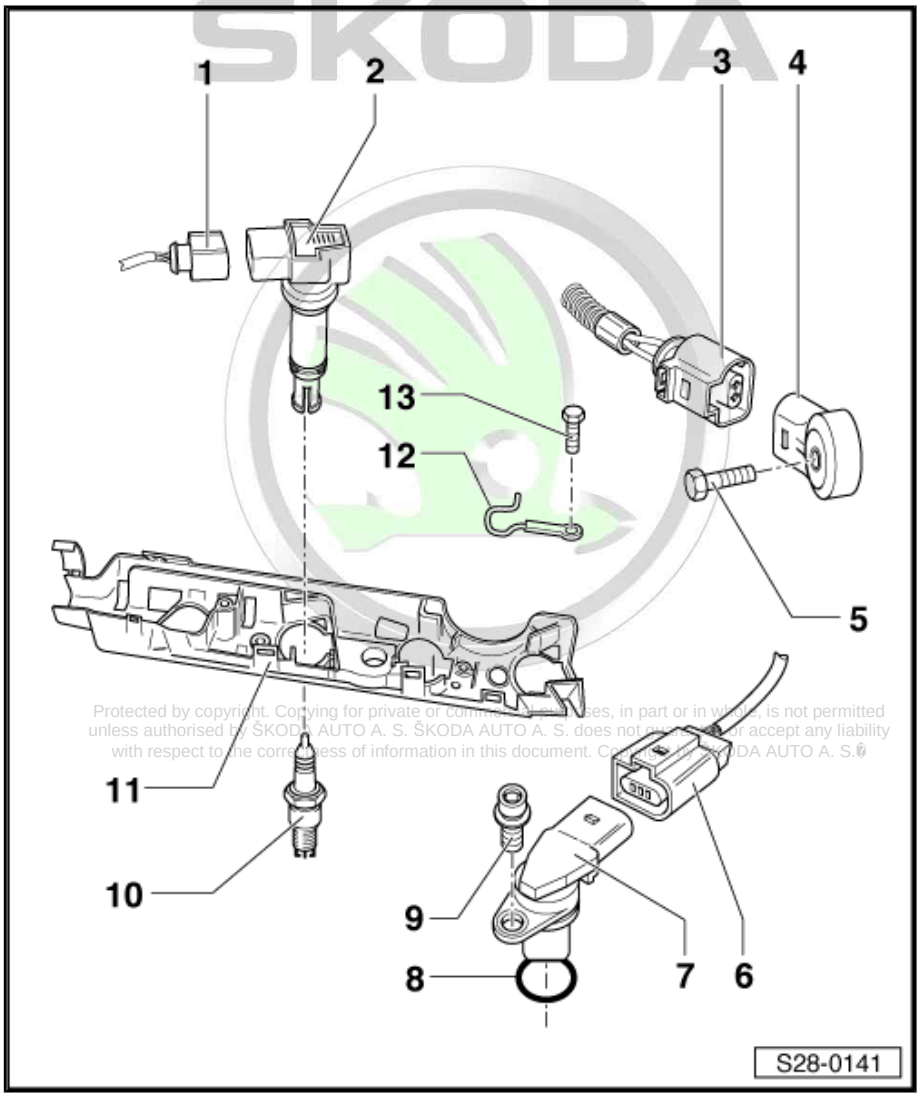
28 – Ignition system

1 Ignition system

General notes on the ignition system ⇒ page 5 .

1.1 Ignition system - Summary of components

Engine speed sender - G28- : ⇒ page 31 , -Position 12-.



1 - Connector

- ❑ Black, 4-pin.
- ❑ release with assembly device - T10118-

2 - Ignition coil with a power output stage - N70, N127, N291, N292-

- ❑ removing and installing ⇒ page 168

3 - Connector

- ❑ Black, 2-pin.
- ❑ for knock sensor I - G61-
- ❑ contacts gold-plated

4 - Knock sensor I - G61-

- ❑ at cylinder block - suction side
- ❑ contacts gold-plated

5 - 20 Nm

- ❑ The tightening torque influences the knock sensor function

6 - Connector

- ❑ Black, 3-pin.
- ❑ Hall sender - G40-

7 - Hall sender - G40-

- ❑ in the camshaft housing

8 - O-ring

- ❑ replace if damaged

9 - 10 Nm

10 - Spark plug, 30 Nm

- ❑ Change interval, type and electrode spacing ⇒ Maintenance ; Booklet Octavia II
- ❑ use spark plug wrench e.g. - 3122 B- for removing and installing

11 - Cable guide

12 - Earth cable

13 - 10 Nm

- ❑ only loosen or tighten with the ignition off

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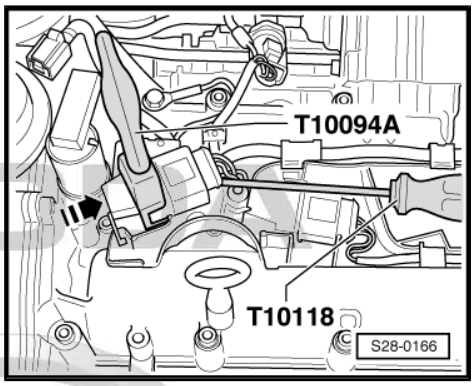
1.2 Removing and installing ignition coils with output stage

Special tools and workshop equipment required

- Assembly device - T10118-
- Extractor - T10094A-

Removing



– Position extractor - T10094A- onto the ignition coil with power output stage in the -direction of the arrow-.
– Slightly pull ignition coil with power output stage out of the cylinder head.
– Position the assembly device - T10118- as shown.
– Carefully unlock the plug lock and disconnect the plug.
– Completely remove the ignition coil with power outage stage from the cylinder head.

Install

– Position extractor - T10094A- onto the ignition coil with power output stage.
– Insert ignition coil with power output stage into the ignition coil shaft.
– Push connector onto the ignition coil with power output stage until it audibly locks into place.
– Press the ignition coil with power output stage with extractor - T10094A- onto the spark plug in the cylinder head.

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